THE IRON TRADE REVIEW

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Heavier Buying for Home Needs

But War Requirements Are Still Heavy—Increased Demand for Steel Making Pig Iron With Prices Advancing

THOROUGH investigation in all of the important centers of the country has developed positive evidence that the demand for leading iron and steel products for uses not connected in any way with the war has steadily increased during the past month, and especially during the past week. The demand from automobile companies not catering to war business and from manufacturers of agricultural implements has added large tonnages to the orders for purely domestic consumption. Buying by American railroads has also improved. One of the largest independent companies in the Pittsburgh district now operating at 85 per cent of capacity believes that fully 70 per cent of its orders represent domestic consumption, although it is impossible in many cases to determine whether or not the orders are due indirectly to the war. In spite of the heavy buying of wire for export, it is thought that not over 20 per cent of the output of wire mills is being shipped to foreign countries. On the whole, the improvement in domestic demand is most encouraging, but the demand for large rounds and other materials for the manufacture of shells is still a highly important factor in present conditions.

Pig Iron

The demand for steel-making pig iron in the Pittsburgh district has suddenly increased to large proportions, resulting in an advance of 25 cents per ton in quotations on basic and bessemer grades. The Youngstown Sheet & Tube Co. is credited with buying from 25,000 to 50,000 tons of basic and it is now known that the Republic Iron & Steel Co., about 10 days ago, made a purchase of 10,000 tons of the same grade. An inquiry for 40,000 tons of steel-making pig iron for export is pending, but high ocean freights at present interfere seriously with shipments to foreign countries. The decision of the United Steel Co., Canton, O., to build a blast furnace is an event of unusual interest, as is also the announcement that Pickands, Mather & Co., Cleveland, have become associated with the Canton enterprise. Blast furnace operators in Ohio and Pennsylvania are being notified that railroads will hereafter charge 20 cents per ton for the removal of slag, for which service heretofore no charge has been made. These notices apply to intrastate business and it is probable that the state utility commissions of other states will follow the lead of West Virginia in suspending the proposed charge, as was recently done by the interstate commerce commission on interstate business until a satisfactory basis for charging can be determined. The proposed charge would amount to about $1,500,000 annually.

Finished Material

The United States Steel Corporation has advanced quotations on plates, shapes and bars for current or third quarter delivery to 1.30c, Pittsburgh, or $1 over the usual quotation. The Cambria Steel Co. has also advanced and other independent companies are expected to do so at an early date. There is very little contracting at present, but specifications are heavy and mills are not anxious to sell for future delivery.

Iron Ore

The demand for lake ores has improved very much and some important transactions have taken place, including the trading of ore for coal. There is much more activity in chartering of vessels for the carrying of ore.

Shapes and Plates

It is estimated that from 75,000 to 100,000 tons of structural material will be required for rapid transit extensions in Philadelphia, which are approaching the contracting stage. Brooklyn elevated work will call for about 5,000 tons of plates. The American Car & Foundry Co. has purchased from 30,000 to 40,000 tons of steel, largely plates, for use in making the 4,100 cars for Russia, recently contracted for. Contracts for structural material in June were the heaviest of any month since April, 1914, and represent about 80 per cent of the capacity of structural shops of the country. The contract for 24,000 tons for the St. Louis bridge has been formally awarded to the American Bridge Co.

THE OPEN HEARTH

Kill the Seamen's Law

OVERWHELMING condemnation of the La Follette seamen's law has swept the country. It comes not only from maritime interests, but also from the press and the people in all sections. It is not confined to any class. Many union labor sympathizers who favored its passage are now protesting against its endorsement. The criticism, therefore, plainly is not an inspired propaganda. It is not in furtherance of any political campaign.

It is born of the fact that the country has finally become thoroughly aroused to its pernicious provisions. It is recognized that the hoped for American merchant marine is made impossible of realization, if such a measure becomes operative. The few stars and stripes that now may be seen on the high seas will disappear altogether. Japanese and Chinese vessels, as well as those of other nations employing oriental crews, would receive a greater benefit from the seamen's law than the governments of those countries could possibly confer upon them by any constructive legislation. Conversely, the law would work more destruction to American shipping than a busy fleet of submarines could.

The Pacific Mail Steamship Co. dissolution, the determination of lines to transfer their registry to foreign flags, the refusal of interests entering American shipping while such an act is on the statutes, and other facts furnish positive evidence of the havoc wrought by the new law, even before it has become effective.

Numerous incongruities and conflicts found in the law have kept the solicitor for the department of commerce and the attorney general busy trying, unsuccessfully, it seems, to learn what the various sections mean and how, if possible, they may be straightened out. It has proven an endless chain of legal and international tangles. One kink which has been ironed out, however, shows conclusively that vessels of many foreign countries would be entirely exempt from inspection by this government. This would give a great financial advantage over American ships, thus aiding foreign shipping and penalizing that of the United States. Moreover, the act bristles with possibilities, even probabilities, of international complications because of proposed treaty abrogations.

Crammed down the throat of the sixty-third congress by an arrogant labor union, the seaman's act was signed at almost the last hour of the final session by President Wilson. Neither he nor more than a handful of members of congress probably understood the absurd provisions of the measure. But it was ordered by labor unionism and that appeared to be all that was necessary.

Some reports have it that the measure will be repealed. Others have it that the administration proposes to keep it on the statute books. That, it is contended, would give added support to the government ship purchase bill by reason of the fact that it would make impossible the entry of private capital into American shipping. Whether the seamen's law is repealed or not, it is safe to predict that a government-owned line of vessels is out of the question. The recent referendum of the chamber of commerce of the United States shows definitely how the business interests of the country feel toward the merchant marine situation. They are utterly opposed to government ownership.

If the present administration does not repeal the seamen's law, there will be a succeeding one which will. But the act ought to be killed as soon as congress meets.

Labor unionism has gained nothing through the passage of this measure. Its enforcement will make employment of the American sailor impossible. In other words, Andrew Furuseth, president of the seaman's union, who is the real author of the measure, has killed the goose that laid the golden egg.

A Great Paper

THE *Commercial and Financial Chronicle,* of New York, has just completed its one hundredth semi-annual volume, thus closing a record of a full half-century. The *Chronicle,* as it is commonly known, has indeed had a remarkable and highly creditable history. Founded July 1, 1865, by the late William B. Dana, a few months after the close of the Civil war, this journal has progressed with the country. It started in a modest way, but with the thoroughness and accuracy which have characterized it throughout all its years. As the marvelous development of the country called for greater service on the part of a journal like the *Chronicle,* every demand was met, not only by the enlargement of the main paper, but by the issuing of numerous supplements from time to time relating to banking, cotton, railways, state and city finances and other subjects, and the mass of information published annually is now tremendous. For many years after the paper was founded, the weekly issue consisted of 32 pages. Nowadays more than 100 pages are frequently published. The *Chronicle,* in its 50 years, has had but two editors, the late Mr. Dana and the present editor, Jacob Seibert Jr. Seldom does a paper continue through so many years with absolute fidelity to the original ideas of its founder. If at times this admirable journal seems to oppose too strenuously so-called progressive ideas, even those who would

THE OPEN HEARTH

like to have it pursue a slightly different policy realize that the accuracy of its information is in no way impaired by its adherence to conservative policies.

The Iron Trade Review cordially extends congratulations to its contemporary and trusts that its career will continue to be one of increasing usefulness and prosperity.

The Slag Controversy

IN discussing the problems arising from the development of terminal railroads at industrial plants when that subject was receiving the attention of the interstate commerce commission, *The Iron Trade Review* spoke of those problems as being the outgrowth of business practices or customs which were inaugurated when the industries were in their infancy. With the increase of industrial operations and the change of sentiment as to the obligations of railroads and shippers to each other and to the public, it became imperative to investigate conditions and determine whether they were just to all concerned. This was a matter of no little difficulty and has not yet been fully worked out. In fact, an order issued by the commission last Saturday, calling upon the trunk lines to reform their tariffs, furnishes additional evidence of the difficulties that are being encountered. The commission asks the trunk lines to make arrangements with the industrial lines "in the light of this report"—whatever that may be.

A similar condition has prevailed in regard to the hauling of slag from blast furnaces. That the problem is not one of small importance is indicated by the fact that it is estimated that the companies interested in the case in which a decision was rendered a few days ago by the interstate commerce commission produce 200,000 carloads of slag every year and would have to pay $1,500,000 each year if assessed 20 cents per ton as proposed by the railroads. Although the disposition of slag would seem to be a very simple matter, its presentation before the interstate commerce commission indicated that it was very intricate. As usual in decisions of the commission, railroads are expected to work out the details of orders made. The commission held that the tariff filed by 11 railroads in western Pennsylvania, Ohio and West Virginia did not conform to the act to regulate commerce, but the commission does not see any reason why this disposal service should be performed gratuitously by the carriers. The tariff, says the commission, should indicate that—

> "The carriers will receive carloads of refuse on any industry, or on any train track, and will haul this refuse to some convenient point on its line or the line of a connecting carrier for wasting at a charge of — cents per net ton."

The commission, it will be noted, refers to the slag as "refuse" and proposes a charge for "wasting". The carriers at the hearings denied that the slag is worth to them more than it costs to handle it, and the commission evidently believed that this is true. At times, it is true, but it is very difficult to understand how the commission could believe that the slag never has been of use to the railroads and never will be. Evidence presented at the hearings demonstrated that often the railroads have begged for the slag to make fills and if anyone will take a ride along a number of the railroads in the Pittsburgh and other districts and see the immense fills that have been made by blast furnace slag, he cannot doubt that the railroads have received from the furnaces material of great value.

If the slag is of no value to the railroads, they should, of course, be paid for disposing of it. If it is of value, they should be willing to pay what it is worth. It ought not to be difficult to determine the facts in every case.

When the interstate commerce commission a few weeks ago rendered a decision requiring railroads to dispose of their lake vessel properties, we predicted that the commission would in due time see the error of its way. Some events which have since occurred confirm that opinion and we now venture the further opinion that justice to the furnaces will in time compel the interstate commerce commission, which, by the way, has had some experience in reversing itself, to revise its decision in the slag case.

Opinions differ widely as to the powers of the federal trade commission and it may be years until, by final decision of the highest courts, those powers are accurately defined, but, in the meantime, it would be well for business men to inform themselves as accurately as possible concerning the federal trade commission act. Hence we take pleasure in calling attention to the hand book on that law which has just been issued by the National Association of Manufacturers. The little book is from the pen of James A. Emery, general counsel of the National Council for Industrial Defense, and gives the legislative history of the law, discussing the powers, duties and procedure of the commission. The supplement contains the trade commission act, the Clayton act, the Sherman act, the Wilson tariff act, a diagram outlining the powers and procedure of the commission and other information. Taken as a whole, the booklet is very valuable and worthy of the author, than whom no one is better able to present clearly this important measure.

Prices Present and Past

Quotations on leading products July 14, average for June, 1915, average for April, 1915, and average for July, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices July 14, 1915.	Average for June, 1915.	Average for April, 1915.	Average for July, 1914.
Bessemer pig iron, Pittsburgh..	$14.95	$14.58	$14.55	$14.90
Basic pig iron, Pittsburgh.....	13.95	13.54	13.45	13.90
No. 2 Fdy. pig iron, Pittsburgh	13.70	13.45	13.45	13.90
Northern No. 2 Fdy., Chgo....	13.00	13.00	13.00	14.00
Lake Superior Charcoal, Chgo..	15.75	15.25	15.75	15.75
Malleable, Bessemer, Chgo.....	13.00	13.00	13.00	14.00
Southern No. 2, Birmingham...	9.50	9.50	9.50	10.00
Southern Ohio No. 2, Ironton.	12.50	12.50	12.75	13.00
Basic, eastern Pa.....	13.75	13.75	13.25	14.00
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.50
No. 2X foundry, Philadelphia..	14.50	14.25	14.25	14.75
Ferro mang., Balt., (prompt)..	100.00	105.00	78.00	37.50
Bessemer billets, Pbgh.....	20.50	19.87	19.50	19.30
Bess. sheet bars, Pbgh.....	21.50	20.37	19.60	20.20
Steel bars, Chicago.....	1.44	1.39	1.39	1.28
Steel bars, Pittsburgh.....	1.25	1.20	1.20	1.11
Iron bars, Philadelphia.....	1.22	1.17	1.17	1.17
Iron bars, Cleveland, local del'y.	1.20	1.20	1.15	1.20
Iron bars, Chgo. mill.....	1.20	1.15	1.15	1.05

	Prices July 14, 1915.	Average for June, 1915.	Average for April, 1915.	Average for July, 1914.
Beams, Chicago	$ 1.44	$ 1.39	$ 1.36	$ 1.28
Beams, Pittsburgh	1.25	1.20	1.15	1.11
Beams, Philadelphia	1.359	1.359	1.309	1.25
Tank plates, Pittsburgh.....	1.20	1.15	1.11	1.11
Tank plates, Chicago.....	1.39	1.31	1.28	1.28
Tank plates, Philadelphia.....	1.359	1.359	1.309	1.25
Sheets, blk., No. 28, Pittsburgh	1.75	1.80	1.80	1.80
Sheets, blue an., No. 10, Pbgh.	1.35	1.35	1.30	1.35
Sheets, galv., No. 28, Pbgh....	4.50	4.46	3.30	2.75
Wire nails, Pittsburgh.....	1.60	1.55	1.59	1.51
Connellsville fur. coke contr...	1.65	1.65	1.65	1.85
Connellsville fdy. coke, contr...	2.25	2.25	2.25	2.29
Heavy melting steel, Pbgh....	11.75	11.75	11.90	11.55
Heavy melting steel, east'n Pa.	12.00	11.25	11.25	10.50
Heavy melting steel, Chgo.....	10.25	9.37	9.30	9.50
No. 1 wrought eastern Pa.....	13.00	12.50	12.50	12.00
No. 1 wrought, Chgo.....	9.00	8.75	8.55	9.00
Rerolling rails, Chgo.....	10.00	10.00	9.85	11.25
Car wheels, Chgo.....	10.00	9.87	9.80	11.00

(For Additional Prices See Page 154)

Heavy Sales of Steel Making Iron

Youngstown Companies and Other Melters Buy Basic—Price of Bessemer and Basic Advances—Moderate Buying of Other Grades

Pittsburgh, July 13.—Another steel-making pig iron buying movement, similar to that which took place the latter part of April, has been under way the last few days. Rather heavy tonnages of basic and bessemer iron have been obtained by central western consumers. The Youngstown Sheet & Tube Co., which took an important part in the last previous buying movement, is understood to have closed for from 25,000 to 50,000 tons of standard basic for the last half of the year, although no official information about prices or the sellers has been given out. The latter part of last April the Youngstown concern bought in the neighborhood of 60,000 tons of basic and gray forge. One valley furnace has sold a "round tonnage" of basic at $13, furnace, and another valley interest has sold 5,000 tons of the same grade at a similar figure. Basic appears to be firmly established at $13, valley furnace, although Cleveland furnaces are reported to have been shading that figure. It develops that the Republic Iron & Steel Co., 10 days ago, obtained 10,000 tons of basic, and other Ohio steel makers have been quietly negotiating for last half tonnages. Sales of bessemer iron have been made at $14, valley, or about 25 cents a ton above the previously prevailing price, and as high as $15, valley, now is being quoted by some interests. One lot of 3,000 tons of bessemer has been sold for export, probably to France, and a prominent exporter has closed for 2,000 tons of this grade with a valley blast furnace interest. The Marshall Foundry Co. has purchased a total of 15,000 tons of bessemer for last half delivery. The Colonial Steel Co. still is negotiating for 10,000 tons of basic. Foundry and malleable grades reflect strength, but are not so active as steel making irons. An inquiry for 40,000 tons of hematite, or special bessemer iron, sent out by an eastern exporter, has been received by valley sellers of bessemer iron.

Ask Big Tonnage for Export

Philadelphia, July 12.—An export inquiry for 40,000 tons of hematite or special bessemer iron for early delivery, which has been put out by the foreign sales department of a steel company in this city, has attracted some attention. The destination is not given, but it is thought to be either England or Italy, and there are other points of indefiniteness about the inquiry which make unlikely an early sale. Eastern makers of standard low phosphorus iron who have been carefully investigating the situation in the British Isles for their product, have reached the conclusion that that market offers them little attraction at this time. At ruling freights, the delivered prices for iron offered at Sheffield, England, and other interior points figure back at the furnace about $3 a ton under the domestic market. There continues a good demand for low phosphorus to eastern makers with Canada furnishing considerable of this. Small sales of standard iron in the week aggregated about 1,000 tons and Lebanon makers are enjoying a fair run of orders. The Midvale Steel Co., Philadelphia, which inquired for 3,000 tons, has closed for only a small amount. Small sales of standard have been done at over $21.50, Philadelphia. Basic is quiet. One special lot is reported at a higher price than $13.75 to $14, delivered, which is the market for standard iron. This probably refers to the closing by a Pottstown, Pa., buyer of 1,500 tons of low phosphorus basic, malleable and a small foundry lot. Foundry iron continues to make some progress toward greater price firmness, but this is not rapid

(*For complete prices see page* 154)

because there is only modest buying. It appears that the market has hardened to $14.50, Philadelphia minimum, or about $13.75 to $13.90, Lehigh and Schuylkill valley furnace, for No. 2X. Sales this week at that figure are noted. Some makers ask 25 to 50 cents more, but are selling little at such figures. The Pennsylvania railroad is distributing its orders for 1,500 tons of mixed grades for Altoona. Virginia iron is quiet and unchanged in price. The No. 2 Swedeland furnace of the Alan Wood Iron & Steel Co. has been blown in.

Sales Increasing

Cleveland, July 13.—A Cleveland company has made a sale of a round tonnage of basic for last half delivery at $13, valley, and other sellers say there would be no difficulty in taking on orders at that figure, but they are not anxious to do so. The general pig iron situation is improving. One Cleveland firm has sold 20,000 tons of various grades this month and others report improvement in inquiries. The demand in the immediate Cleveland district, however, is not strong.

Buying is Low

Cincinnati, July 13.—A Louisville, Ky., melter has taken 500 tons of southern foundry iron for the last half, this being the only purchase of any size in this market during the past week. Inquiries still pending include 500 tons of foundry iron from a local consumer, 800 tons and 500 tons of foundry iron for the first half from two melters in Richmond, Ind., and 500 tons of foundry iron for July and August from the Southern railway. Southern furnaces are not willing to quote beyond the first of the year except at large premiums. Southern prices are given at from $9.50 to $10, Birmingham basis, for No. 2 foundry, and southern Ohio No. 2 foundry is quoted at from $12.50 to $12.75, Ironton basis, both for last half delivery.

Pig Iron Demand Grows

Chicago, July 13.—Increasing inquiry is coming out in the Chicago pig iron market, malleable especially gaining much in activity. Some melters who bought once for last half are finding their requirements increasing sufficiently to make a second order necessary and prospects are that tonnages for last half will be considerably larger than have been indicated so far. Some malleable inquiries run to considerable tonnages, 1,000 to 5,000 tons being asked for by various melters. Foundry iron is also fairly brisk and a number of furnaces find their engagements are sufficient to take the entire output of active stacks well through the third quarter.

Both malleable and foundry iron are being contracted on the basis of $13, Chicago furnace, for third and fourth quarter. Some activity is developing as to iron for delivery after Jan. 1, but these inquiries are believed to be simply feeling the market and are not taken seriously. Quotations have been refused consistently beyond the end of the year.

Southern iron is not moving well and prices are not as firm as was the case last month. While $9.75 and $10, Birmingham, are being quoted by most sellers, the rumor persists that iron may be obtained at $9.50, Birmingham.

Bookings during June were slightly less than during May, but July thus far has shown greater activity than any month during the present year. Should the present rate of buying continue through the month, July probably will be the banner month of the first seven.

Revival of demand by malleable melters apparently comes from a number of causes. Railroads have begun buying equipment more liberally, agricultural implement builders are opening their season earlier than usual, after a long period of slackness, and automobile builders are also increasing their activities and these factors have united to cause an increased demand for malleable products.

Fair Buying in New York

New York, July 13.—Sales of probably 15,000 tons the past week have attested the continuation of a fair, but spotted buying of iron in this territory. Some of this iron has been for shipment after Jan. 1 and through the first quarter, on which makers usually have stood out for and obtained some advances over current prices. An East Orange, N. J., buyer who inquired for 1,250 tons of No. 2X and a lower grade for last quarter and first quarter bought the former around $14.25, delivered, and a Buffalo maker is commonly believed to have made the sale at about $12.50, furnace. The remainder went to eastern Pennsylvania at about 25 cents less. A Torrington, Conn., shop bought about 2,500 tons of foundry and malleable, partially for delivery beyond Jan. 1, and paid some advance, which in the case of Buffalo iron is said to have been more than 25 cents. This business was divided between several makers. A Fitchburg, Mass., machinery builder closed for 2,000 tons of No. 2X for last half, dividing between Buffalo at $13, furnace, and a New York state maker. An Elizabeth buyer took 1,000 tons of 3¼ to 4 per cent silicon iron for this year from an eastern Pennsylvania maker at about $14.35, delivered, and still figures on 1,000 tons. Another sale of 2,000 tons of No. 2X to a New Jersey foundry for last half was made. Activity of some Buffalo makers in still quoting $12.50, furnace, for No. 2X, or $14.34, delivered in New Jersey territory, tends to keep the tidewater market in uncertainty and there has been no actual improvement over the price range there of $14.25 to $14.50, delivered. Southern makers have made further sales to speculative interests in this district at $10, Birmingham. One of these lots was 1,500 tons to a banker and another was 5,000 tons to a consumer in this territory, who is expected to hold the metal for a rise. The American Brake Shoe & Foundry Co. is inquiring for 2,500 tons of mixed foundry grades for last half for plants in the Chicago district. The Eastern Malleable Iron Co., which has been seeking a block of malleable at prices below the ideas of most makers, still is figuring. Some furnaces have withdrawn their quotations on this block. Higher prices continue to be obtained by sellers on bessemer for export. The week's foreign sales have been small. Some tonnage remains pending.

Activity in Malleable

Buffalo, July 13.—The feature of the Buffalo pig iron market for the week was the development of an inquiry for malleable iron. Orders for several thousand tons were placed exclusive of the closing for a portion of the 10,000 tons inquiry of the Eastern Malleable Co., of Naugatuck, Conn. One Buffalo furnace interest took approximately 1,000 tons of this lot at $12.50 and possibly as low as $12.25, although this producer states that its minimum price on all grades, exclusive of off-iron, is positively $12.50. The rest of the order is either pending or placed outside the territory.

The furnaces here quoted on several thousand tons of foundry grades and malleable at prices ranging from $12.50 to $13.25. The producers agree that the prospects for further orders are good, although the iron business is but beginning to show signs of taking up the expansion noted for some weeks in the finished material lines.

The furnaces are beginning to reestablish grade differentials. Interests that are quoting $12.50 on No. 2 plain decline to accept $13 flat on No. 1 foundry, asking from $13.25 to $13.50 on the high silicon irons. The situation seems to be assuming a shape where an advance in prices may be expected.

(*For complete prices see page* 154)

Sheets Active

Indications Are Specifications Will Exceed Those of June

Pittsburgh, July 13.—Decided improvement in domestic demand for steel sheets is reported by manufacturers of material for special purposes. Automobile makers, manufacturers of electrical equipment and car builders are specifying briskly and general demand is heavier than previously. Sheet mills are operating at about 75 per cent of capacity and very little of the tonnage produced in western Pennsylvania and eastern Ohio is being shipped abroad. The American Sheet & Tin Plate Co. is receiving heavy specifications and indications are that this month will prove even more satisfactory than June, the most active month in more than two years. Galvanized sheets are obtainable at 4.50c and black sheets are being sold, in some instances, at 1.75c for base size gages.

Again Advance in East

Philadelphia, July 13.—Further advances in price are being held for by eastern Pennsylvania sheet makers, as the incoming tonnages remain active and capacity is fully employed. Leading makers in this district now quote No. 10 gage from 1.40c to 1.50c, Pittsburgh, or 1.559c to 1.659c, Philadelphia, according to the period of delivery. The higher figure represents a new advance of $2 a ton. Eastern Pennsylvania makers are so well satisfied with their present rate of booking that they are not desirous of obligating their forward tonnage except at a considerable advance.

Blue Annealed Higher

Cleveland, July 13.—The demand for sheets is more active and prices are firmer. On No. 10 blue annealed, 1.40c, Youngstown, is the usual quotation, while some tonnage has been sold as high as 1.45c.

Sheets Remain Weak

Chicago, July 13.—Continued inability of most sheet makers to make and market galvanized sheets under the adverse conditions produced by high spelter prices is a heavy drag on the sheet market. Some mills are taking tonnage at 4.60c, Pittsburgh, for No. 28 gage galvanized, but a new set of differentials is in effect which depart materially from those usually obtaining. This is due to the fact that spelter represents a much larger proportionate part of the cost than under normal conditions and the differentials, therefore, are considerably out of line, viewed from the standpoint of ordinary prices. Independent mills in the west are not making contracts for galvanized nor taking any prompt business, although some mills in Ohio are willing to contract at a high price.

Black sheets remain weak at former quotations with demand small.

Sheets Steady

Cincinnati, July 13.—The sheet market is steady and all rolling mills but one in this territory are running full in all departments. It has been officially denied that the American Rolling Mill Co., Middletown, O., is running mostly on war orders, as over 90 per cent of the capacity of its plants is being used for the manufacture of its regular products. Sales are being handicapped by the refusal of mills to sell on contract at present quotations. Black sheets No. 28 gage are given at from 1.75c to 1.80c, Pittsburgh basis, and galvanized No. 28 gage at from 3.75c to 4c, Pittsburgh basis.

Foreign Order Booked

Pittsburgh, July 13.—The American Sheet & Tin Plate Co. has received a large order for tin plate for shipment to the far east, at a price considerably above the domestic market. While foreign inquiries involve heavy tonnages, yet comparatively little material is leaving this country. Tin plate mills are operating at maximum capacities.

Cast Iron Pipe

Fair Number of Public Contracts Are Being Let

New York, July 13.—Buying of cast iron pipe in eastern districts appears to be holding its own, in volume, and this also may be said of prices, which are more uniform at better levels. A fair number of public contracts is being let and there is a good tonnage in private requirements, such as those for water and gas companies. New York City has been figuring on about 3,000 tons in contractors' lettings and the Soraci Contracting Co. is low on 2,400 tons of 6 to 8's bid upon yesterday. Bids go in tomorrow on 600 tons of 4 to 16's. The Standard Cast Iron Pipe & Foundry Co. took the Yonkers, N. Y., letting of 425 tons of 6 and 8's at $23.92 and R. D. Wood & Co. the 340 tons of 6 and 12's for Syracuse, N. Y., at $23.39, delivered. Tottowa, N. J., is offering 1,370 tons of 4 to 10's for bids July 19, and Albany, N. Y., 800 tons of 6 to 12's on the same day. Edgewater, N. J., has in the market 575 tons of 16 to 72's, which is a contractors' letting. There has been some renewed life in certain export inquiries, including some for Cuba and South America, and eastern shops are pursuing these matters.

(*For complete prices see page* 154)

Few Cast Pipe Orders

Chicago, July 13.—Buying of cast iron pipe for municipalities' use is not heavy, most cities having covered their requirements earlier in the season. Makers of pipe find themselves kept busy filling former orders and the absence of new business is not keenly felt. Bids were opened recently at Oglesby, Ill., on 700 tons and the Glamorgan Pipe & Foundry Co. was low bidder. Award on this business is held up until test of a well has been completed to determine whether the water supply is ample. Bids were opened at Covington, Ky., on 3,587 tons, the United States Cast Iron Pipe & Foundry Co. being low bidder. Bids will be opened at Ahmeek, Mich., July 16 on 275 tons.

Warehouse Prices

Advanced in New York District—Improvement Continues

New York, July 13.—An advance of $2 a ton, which had been expected for several weeks, now has been put into effect in warehouse prices in the metropolitan district. These changes place plates and shapes at 1.95c and steel bars at 1.90c, delivered in metropolitan territory. Iron bars now are quoted at 1.70c to 1.75c, delivered from store. The warehouse business in the metropolitan district has been expanding steadily and during the present month has been especially active. The tonnage moving for some of the leading warehouses so far in July has been considerably ahead of normal.

Warehouses Are Busy

Chicago, July 13.—Settlement of the building trade strike in Chicago is expected to have its effect shortly on warehouse business, which has been somewhat handicapped for weeks on account of building operations being tied up.

Other demand is normal and warehouses are doing an excellent business. Galvanized sheets remain at 4.85c to 5c, Chicago store, and steel bars are steady at 1.65c, Chicago store, although an advance is expected shortly to keep up with mill prices.

The American Plumbers' Supply Co., Toledo, O., dealer in plumbers, gas and steamfitters supplies, has purchased a $40,000 site and will build a three-story fireproof building on the site to be used as show and sales rooms, office and warehouse.

Ship Steel to Pittsburgh

Billets from the Chicago District Help Make Up Shortage —Prices on Semi-finished Products Advancing

Chicago, July 13. — Western mills of the Steel Corporation are shipping steel billets from Chicago to Pittsburgh for its mills to roll into finished products. About 20,000 tons of billets have been sent from here to Pittsburgh and the demand from those plants is still being met from this end.

The plant of the Illinois Steel Co. at Gary, Ind., is now operating full with the exception of the rail mill, which is of so large capacity, normally 75,000 tons per month, that it never has been operated at full speed. The entire battery of open hearths is now active except those which are under repair and the output of steel is sufficient to allow an excess which can be sent to eastern mills which cannot produce sufficient to keep their rolling mills in full operation.

Eastern Billets Go Higher

Philadelphia, July 12.—Shortage of open hearth steel, as illustrated in the purchase a week ago by the Carnegie Steel Co. of a round tonnage of an eastern Pennsylvania steel maker previously reported in *The Iron Trade Review*, has continued to stiffen the prices of leading producers in this territory. One of these makers now is holding 4 x 4-inch open hearth rolling billets at $25, Philadelphia, or approximately $22.50, Pittsburgh, and forging billets at $29, Philadelphia, or an advance in ten days of $1.50 to $2. This mill has withdrawn all quotations made for export and finds itself with only a limited tonnage free for the domestic trade. Another large works in eastern Pennsylvania is holding open hearth rolling billets at $23, mill, or about $24.25, Philadelphia, and $21.70, Pittsburgh. Eastern Pennsylvania makers report a heavy demand and good bookings of billets from all directions, some of which is from the Pittsburgh territory. The Carnegie Steel Co., before making its recent purchase, approached various eastern steel companies for open hearth billets, including some plate makers, but found that the latter also had little crude steel to spare. It has made no further purchases in the east since the one reported. Current inquiries in the market include 1,500 tons of bessemer sheet bars for an eastern tin plate manufacturer and 900 tons of forging blooms for a buyer in this district. Middle western mills are quoting bessemer billets at $21, Pittsburgh or Youngstown.

Semi-Finished Prices Soar

Pittsburgh, July 13.—What little semi-finished material is being offered in this district is held at rather high figures. Some expressions are heard that open hearth sheet bars are not obtainable at less than $23, mill, although no sales at that figure are reported. In the absence of sales in the open market, it is difficult to obtain much of a line on the situation. Forging billets are being held at $27, Pittsburgh, and wire rods are commanding $26 a ton. Specifications for wire rods are heavy and three of the more important makers have withdrawn from the market for the remainder of the year.

High Quotation

Cleveland, July 13.—A Cleveland buyer was quoted $22, Youngstown, today on bessemer billets and all indications are that there is a shortage of semi-finished steel with prices showing a tendency to advance rapidly.

Furnace Coke

For Spot Delivery Declines—Foundry Coke Advancing

Pittsburgh, July 13.—The market for spot furnace coke is not so strong as it was a week ago, it being understood that at least one interest has offered standard grades at $1.60, ovens. On the other hand, some dealers still are asking $1.75, ovens. The Reading Iron Co. is in the market for from 5,000 to 6,000 tons of blast furnace fuel a month the last half of the year, but no other inquiries of importance are reported. Contract furnace coke is being held at about $1.75, ovens. Specifications for foundry coke still are light. The Connellsville Courier for the week ending July 3, says production was 371,414 tons, an increase of 15,936 tons, compared with the week before.

Foundry Coke is Advanced

Philadelphia, July 12.—Leading makers of foundry coke including W. J. Rainey and the Jamison Coal & Coke Co. have advanced their prices 10 to 20 cents a ton. The Rainey brand now is quoted at $2.50, ovens, for prompt and at $2.60, ovens, on contract, against a flat price of $2.40, ovens, recently for both prompt and contract. The new Jamison price is $2.70, ovens, for both contract and prompt, against $2.60, ovens, formerly. An eastern Pennsylvania steel company has purchased 10,000 to 15,000 tons monthly of Connellsville furnace coke for shipment over the next three months at $1.85, ovens. This price more generally is being quoted on the better brands of furnace coke for early delivery.

Foundry Coke Sold

Cincinnati, July 13.—The Louisville & Nashville railroad has taken 3,000 tons of foundry grades. A Virginia furnace is out with a tentative inquiry for from 10,000 to 20,000 tons of 48-hour coke. The market is quiet after a month of good buying, during which time foundries closed for next year's requirements. Shipments on old contracts are heavy. Prices are unchanged for contract coke in either the Pocahontas, New River or Wise county districts.

Foundry Grades Higher

Cleveland, July 13.—The prices of foundry coke are advancing and contracts are being made for Rainey coke at $2.60, and Jamison at $2.50.

Bolt Market

Is Active—Railroads Contract and Specify Promptly

Cleveland, July 13.—The recent improvement in the nut and bolt market is being sustained. A number of railroads have contracted and one central western road followed the making of a contract by immediately specifying a million bolts of one size. The rivet market is in a much more satisfactory condition and the new quotations are being well maintained.

Nuts, Bolts and Rivets

Pittsburgh, July 13.—Specifications for nuts, bolts and rivets are coming out in good volume. Fairly heavy tonnages are being shipped to Europe and South America. Advanced quotations, announced 10 days ago, have been established and further advances are not improbable.

Enlarges Plant

The Standard Steel Tube Co. is enlarging its plant at Detroit and Fitchland avenues, Toledo, O. The addition consists of a one-story brick and steel building of sawtooth construction, 120 x 110 feet, and it will be ready for occupancy by Aug. 1. George B. Storer, general manager of the concern, states that the plant is making auto tubes night and day.

(For complete prices see page 154)

Plates in East Firmer

And There is Less Irregularity in the Chicago Market —More Boats to be Awarded

Philadelphia, July 12.—Some of the eastern Pennsylvania plate makers who have been trailing the market in advancing prices have been tightening their schedules as orders have continued to come to them in an increased volume. One of these mills now is holding for 1.25c, Pittsburgh, and this is the more general price, although some 1.20c quotations for early shipment still are being made. It is believed that a few weeks more of the present improvement will see the market firmly established at 1.25c, Pittsburgh. An eastern railroad offered some tonnage in the week at 1.15c, Pittsburgh, but found no takers. Universal plates remain backward, but in all other descriptions the tonnage is good. In the case of one eastern Pennsylvania mill, orders have exceeded 100 per cent and operations are practically full. Shipyard steel is active. The Ocean Steamship Co. is about to award two to three boats and the Standard Oil Co. is planning further awards. The Worth Bros. Co. is low on about 2,300 tons of plates for the United States collier CAYUNA, to be built at Mare Island, Cal. It bid 1.15c, Coatesville, as against 1.22c, Coatesville, by the Lukens Iron & Steel Co., and 1.25c, Pittsburgh, by the Carnegie and Jones & Laughlin Steel companies. Such Pacific coast business is usually considered of the export class by makers. About 1,000 tons of shapes for this boat also were bid upon.

Heavy Tonnage for Cars

New York, July 13.—About 5,000 tons of plates will be included in the structural requirements of section No. 1 of the Culver avenue elevated line in Brooklyn, bids for which will be received July 20. Three other subway sections put out for bids within a few days also call for a round plate tonnage. The American Car & Foundry Co. in the week was the buyer of a large tonnage of steel amounting to 30,000 to 40,000 tons, considerable of which was plates, to cover the 4,100 cars for Russia taken recently. Most of this business went to Chicago mills, where about 2,500 of these cars will be built and the remainder to eastern Pennsylvania makers, covering that portion of the order to be executed in eastern shops. Plate prices show more firmness, especially among certain eastern Pennsylvania makers who have been making concessions, and while 1.20c, Pittsburgh, and 1.369c, New York, has not disappeared, the tendency is toward 1.25c, Pittsburgh, as a firm level.

Plates More Active

Pittsburgh, July 13.—The Baltimore & Ohio railroad is expected to close shortly for 2,000 freight cars, similar in type to those recently purchased by the Pennsylvania lines, and it is understood the New York Central interests and the Philadelphia & Reading railroad also contemplate buying cars of large type, although definite programs have not been announced. Steel plates still show some irregularity, but an analysis of the situation indicates that the trend of the domestic market has been upward for several months.

Plates Gain Strength

Chicago, July 13.—Steel plates are continuously stronger and 1.39c, Chicago mill, appears to be the minimum at present. Large car buying orders have brought out specifications for tonnages which have filled mills pretty thoroughly and low quotations which had been current for some time have disappeared for the most part. While plates are not yet on the same basis as bars and shapes, it will not require much more business to bring them to the same level.

Domestic Ferro

Is Factor of Increasing Importance in the Market

New York, July 13.—Merchant production of ferro-manganese by domestic makers is being increased and this metal is becoming a larger factor in the market. A conversion arrangement has been made by an eastern seller with an eastern Pennsylvania steel company whereby a considerable tonnage will be manufactured for the market and offered by the former. It is known that in some cases this seller has offered to take on business up to 5,000 tons for extended delivery from an important consumer in the middle west. A large independent steel company, which heretofore has not been active as a seller, is offering prompt domestic metal at $100, seaboard, presumably in behalf of a closely-associated company. As already noted, the Dunbar, Pa., interest is making 80 per cent ferro-manganese from Brazilian ores and there are reports of further undertakings by the electrolytic process, in addition to the present operations in California and Niagara Falls.

The increased offering of domestic ferro-manganese has given rise to some reports of lower prices for forward delivery. A western Pennsylvania steel company is credited with having purchased some forward tonnage considerably under $100 at the maker's plant. The English price is unchanged at $100, seaboard, and sales of several hundred tons at this figure against shipments to arrive in July or August, are noted. Premiums for prompt delivery are not being paid by consumers to the same extent as recently, although there is considerable inquiry of this description.

Some current reports that the English government is contemplating cutting down the rate of shipments recently licensed for this country are not confirmed and the evidence is to the contrary. Some direct sellers who a few days ago were advised that their July tonnage might not be as large as originally arranged now have been cabled that the deliveries will come forward in the original amounts. Arrivals of the week, including that aboard the steamers, POMERANIAN, DOMINION and VEDEMORE, total at least 2,000 tons and several thousand tons additional are afloat. There is a constant buying of domestic spiegeleisen at unchanged prices. An eastern Pennsylvania maker is inquiring for 500 tons.

Ferro-Manganese Active

Pittsburgh, July 13.—Fairly active demand for ferro-manganese is enjoyed by dealers. Numerous small lots are being sold at $100, seaboard, and above, for prompt delivery and several tonnages for future shipment have been purchased. Reports of prevailing quotations being shaded lack confirmation. Other alloys reflect strength. Fifty per cent ferro-silicon is firm at $73, Pittsburgh, for small lots. Ferro-tungsten is being held at $3 a pound of contained tungsten and ferro-vanadium is strong at $2.25 a pound. Ferro-chrome is commanding 20 cents, Niagara Falls, and nickel is listed at 50 cents a pound. Ferro-carbon titanium is quoted at 8 cents to 12½ cents a pound in carload lots.

The Latrobe Electric Steel Co., Latrobe, Pa., has completed plans for the installation of rolling mill and forging equipment, for the manufacture of high speed steel and other high grade carbon and alloy steels. Additional electric furnace capacity will be provided.

(For complete prices see page 154)

Shapes for Elevated Work

Will Amount to a Large Tonnage—St. Louis Bridge Awarded to the American Bridge Co.

Philadelphia, July 12.—Important structural undertakings continue to loom ahead in this district, principal among which at present are the extensions of the rapid transit system in this city, which indicates early action, although efforts now being made to legally enjoin this work may tie it up for some time. While no accurate estimate of the total steel requirements of this work yet has been given, it is unofficially stated they probably will run 75,000 to 100,000 tons. Plans now are out for a subway section under the City Hall and they will be issued in about two weeks for the first section of the Frankfort elevated system. Municipal pier construction also is being offered and there are a number of war plant, shipyard and other industrial extensions which are quietly taking form, in some cases involving 5,000 tons for single contracts. The American Car & Foundry Co. is buying of eastern mills about 7,500 tons of shapes for 1,500 cars for Russia to be built at Berwick. Eastern Pennsylvania shape mills are quite fully engaged at present, one of them at double turn on the heavy tonnage recently entered. Not much new business now is being entered, but makers are in a more independent position. The 1.20c, Pittsburgh, or 1.359c, Philadelphia, price for early delivery still is being made, though there is further hardening at 1.25c, Pittsburgh. Some fabricators are beginning to quote higher.

Not So Active

Pittsburgh, July 13.—Demand for structural material is not so heavy as that for steel bars. Most mills are in a position to offer rather quick deliveries and fabricating shops are in need of additional tonnages. Some structural material is being exported, but the bulk of that rolled in this district is going to the domestic trade. Shapes are held at 1.25c.

Largest Since April, 1914

New York, July 13.—Structural lettings to the shops in this country in June were the largest since April, 1914, and totaled 80 per cent of full capacity, or approximately 138,000 tons. This is in accordance with the monthly statistics of the Bridge Builders' and Structural Society, compiled in connection with the monthly meeting at New York City, July 9. The June tonnage was exceeded in only one instance since the issuance of the monthly structural reports was adopted. War plant extensions and a liberal amount of municipal work were responsible in swelling the June total.

The reports of the Bridge Builders' Society show the percentage of capacity contracted for monthly and the approximate tonnage for each period as follows:

Month.	Per cent.	Approx. tonnage.
June, 1915	80	138,000
May	61	105,000
April	62½	107,500
March	64	110,000
February	30	51,000
January	25	43,000
December, 1914	35	60,000
November	20	35,000
October	35	60,000
September	38½	65,000
August	27½	48,000
July	68	115,000
June	56½	95,000
May	57	97,000
April	88	151,000
March	76	130,000

Conditions in the structural steel market in metropolitan territory are better as the tonnage now being acted upon is heavier and there is more work in immediate prospect. Apartment house construction in the metropolis is showing a belated revival and a considerable tonnage of this character now is being let or bid upon. Three more subway sections, two in Brooklyn and one in Manhattan, have been offered for figures with total requirements of probably 15,000 to 20,000 tons. The larger tonnage of specifications recently received by the mills has had its effect upon prices, which are firmer. Small orders are bringing 1.25c, Pittsburgh, or 1.419c, New York, and the mills are taking a stronger position in granting concessions from that figure, although 1.20c Pittsburgh, has not been eliminated.

Low Figuring

Cleveland, July 13.—No large structural projects are pending at the present time, but shops are fairly busy and the outlook is more encouraging than for some time. It is still evident, however, that many fabricators are figuring on a basis of 1.05c, Pittsburgh, for plain material. They are able to do this on account of having made contracts some time ago.

Structurals More Active

Chicago, July 13.—With bookings of large tonnages by the leading interest and considerable increase in business for other mills and fabricators, the position of structural shapes is much firmer. Formal announcement has been made of the award to the American Bridge Co. of 24,000 tons involved in the east approach of the municipal bridge at East St. Louis, Ill. An effort by a competitor to land this tonnage at a slightly higher bid by doing extra fabricating work and loaning machinery to the city for erecting the steel did not avail and the tonnage went to the lowest bidder on the specifications furnished.

Other structural projects closed in the west recently are for small tonnages of no essential importance.

One large item of business which looms in the future is the structural material for the Union Terminal on the west side of the river in Chicago, which will be a heavy item, the size of which will not be known until plans are completed. Structurals have strengthened to a basis of 1.44c, Chicago mill, with most makers well supplied with orders far into the future.

Awarded to American Bridge Co.

St. Louis, July 12.—The contract for 24,000 tons of structural steel to be used in completing the East St. Louis approach to the Municipal free bridge over the Mississippi river, was awarded to the American Bridge Co. by the board of public service of St. Louis, Friday, at a price of $1,035,000.

The American Bridge Co. submitted the lowest bid, June 29, but the contract was temporarily held up pending investigation of a bid of the Pennsylvania Steel Co., which was about $40,800 higher than the American Bridge Co., that it could save the city money by lending heavy machinery for the construction work.

President Kinsey, of the board of public service, said that after investigation it was found that the offer of the Pennsylvania Steel Co. would not save the city more than $15,000, and that he had been informed by the city law department that modification or qualifications of bids submitted could not be considered.

CONTRACTS AWARDED.

City of St. Louis, Mo., eastern approach of municipal bridge, East St. Louis, Ill., 24,000 tons, to American Bridge Co.

Mineral Range R. R. Co., Duluth, Minn., approach to Portage Lake draw bridge, Houghton, Mich., 289 tons, to American Bridge Co.

Pettibone-Mulliken Co., structural steel for machine shop at Cicero and Division streets, Chicago, 175 tons, to American Bridge Co.

Great Western Sugar Co., sugar warehouse, Loveland, Colo., 170 tons, to Jackson-Richter Iron Works, Denver, which sublet it to Jos. T. Ryerson & Son.

Laundry building for St. Luke's hospital, Chicago, 100 tons, to Gage Structural Steel Co.

Extensions to the plant of the New Jersey Zinc Co., at Hazard, Pa., and Palmerton, Pa., 1,400 tons, to independent shops.

Apartment house, Park avenue, between

(For complete prices see page 154)

Fiftieth and Fifty-first streets, New York City, 1,500 tons, to Passaic Structural Steel Co.

Loft building for the Frederick Ayer Estate, West Thirty-sixth street, New York City, 1,100 tons, to Levering & Gerrigues.

Bridges for the Boston & Albany railroad, 600 tons, to the Pennsylvania Steel Co.

Bridges in Alabama for the Gulf, Florida & Alabama railway, 700 tons, to the American Bridge Co.

Loft building for the Gratsch Mfg. Co., Brooklyn, 250 tons, to the Hedden Iron Construction Co.

Apartment house for the Charmion Construction Co., West Fortieth street, New York City, 1,100 tons, to the Hinkle Iron Works.

Mill building for the Berkshire Knitting Co., Reading, Pa., 500 tons, to the Phoenix Iron Works.

Bridge for the Pennsylvania railroad at Manyunk, Pa., 575 tons, reinforcing bars, general contract awarded R. Larry Eyre, Philadelphia.

Elevation of tracks for the Pennsylvania railroad at Freeport, Pa., awarded McMenamin & Sims, Philadelphia; considerable tonnage of reinforcing bars required.

Shoe factory for the Ayer estate, Long Island City, 500 tons, to Geo. A. Just.

Office building for the Ethan Flagg estate, Yonkers, N. Y., 300 tons to C. W. Simpson & Co.

School No. 14, Rochester, N. Y., 250 tons, to the Genessee Bridge Co.

Faglasso apartment, Washington place, New York City, 150 tons, to Phillip Lenges.

Addition to the Backer loft building, Twenty-ninth street and Fourth avenue, New York City, increasing this job from 500 to 1,200 tons to Geo. A. Just.

CONTRACTS PENDING.

Substructure for municipal pier for the city of Philadelphia in the Delaware river between McKean street and Snyder avenues, 1,500 tons, bids being taken.

Six additional bridges for the Pennsylvania railroad, 1,750 tons, bids to be taken July 16.

Shop buildings for the Seaboard Air line, Portsmouth, Va., 600 to 700 tons, bids being taken.

Hotel Des Artistes, Sixty-seventh street, New York City, 1,000 tons, bids being taken.

Apartment house at 144th street and Riverside drive, New York City, 800 tons, bids being taken.

Apartment house, East Forty-seventh street, New York City, for the Fullerton-Weaver Construction Co., 1,800 tons, bids being taken.

Grandstand for the American League Baseball Park, Long Island City, 1,500 tons, bids being taken.

Garage for the Cadillac Motor Co., Long Island City, 300 tons, bids being taken.

Highway bridge over the Passaic river, Pine Brook, N. J., 250 tons, bids being taken.

Loft building at 53-57 West Twenty-third street, New York City, about 1,500 tons, plans being prepared.

Hotel, Bridgeport, Conn., 500 tons, offered by Jas. Stewart & Co., New York City, general contractors.

Section No. 3 of the Eastern Parkway subway line, Brooklyn, bids to be taken July 27, 11,650 tons.

Section No. 2 of the Eastern Parkway subway line, Brooklyn, bids to be taken July 28, 5,700 tons.

Section No. 3 of the Broadway-Fourth avenue subway line, New York City, bids to be taken July 27.

Bids close July 21 on the city-county building, Pittsburgh, involving 5,600 tons.

Checking Abuse

Through Plan Adopted by Bridge Builders' Society

A movement recently espoused by the Bridge Builders and Structural Society to bring about an end to unfair practices and to induce more trade regularity where bids on structural steel are made to general contractors and to third parties, is making general progress. Leading fabricating and structural steel interests which are not represented in the membership of the society are adopting this plan and local structural societies in various cities are taking up the matter. Certain companies have adopted the policy of making it a prior condition in quoting on steel to a general contractor that the latter shall state whether or not he is using the prices of the particular fabricator in making his general bid and that, in the event of his bid being successful, he shall notify the steel company to that effect.

This stand on the part of the fabricating steel trade of the country has been forced by the fact that many general contractors have not been acting in good faith in receiving prices on steel from the shops. After using a steel bid to prepare a general bid, the general contractor frequently has declined to consider this a final matter, so that instead of awarding the order to the particular company when the general contract was obtained, he has employed the steel figure merely as an instrument for shopping about and of developing lower prices from other companies. The fabricator consequently loses the amount expended in preparing the estimate.

In a recent set of resolutions adopted by the society, this practice of certain general contractors is condemned. As one method of checking this abuse, an effort dating from July 1 is being made to induce all architects and owners to receive prior to or simultaneously with the bids of the general contractors, a separate bid on the structural steel requirements where the amount exceeds 250 tons. This bid is to be submitted with the understanding that if it is the most favorable, it will be accepted or recommended for acceptance when the general contract is let.

Small Southern Orders

Birmingham, Ala., July 12.—There is some inquiry for next year business, it is reported, but so far no 1916 quotation has been made by Birmingham smelters. No. 2 foundry, Birmingham, is strong at $10 for delivery through the remainder of this year. One order of good tonnage is reported to an eastern buyer during the week, but it is stated by makers that business is confined mostly to small orders. There is a better general feeling in the iron business following the recent announcement of three more furnaces going into blast.

(For complete prices see page 154)

Cotton Tie Price

Is 35 Cents Per Bundle, the Highest Since 1908

Pittsburgh, July 13.—Manufacturers of cotton ties, taking due advantage of the tariff wall provided by the war in Europe, last week opened books for the 1915 season at 85 cents a bundle of 45 pounds, July basis. This is the highest price to be announced since 1908; it is 20 cents above the quotation adopted at the opening of the season a year ago, when importation of foreign material was threatened. Some sales already have been made at 3 cents above the generally prevailing figure. Cotton crop prospects this year are not so bright as a year ago and it is probable production of cotton ties will drop from about 75,000 to 60,000 tons. According to government figures, plantation owners have deliberately reduced areas planted, from 37,406,000 to 31,535,000 acres.

The highest price to prevail in many years was in 1907, when the market opened at 95 cents a bundle; the 65-cent price announced a year ago was the lowest out for a dozen years.

Malleable Purchase

Buffalo, July 14. (By wire.)—The Stanley G. Flagg Co., Philadelphia, has bought 1,000 tons of malleable at $12.25, Buffalo. The Eastern Malleable Co., has bought 5,000 tons of its inquiry for 10,000 tons. The minimum price on all grades now is $12.50.

Hugh Kennedy Recovers

Buffalo, July 13.—Hugh Kennedy, vice president and general manager of the Rogers-Brown Iron Co., who was seriously injured in a fall from a stock larry, while showing visitors through the company's Susquehanna plant last April, has almost entirely recovered. Both Mr. Kennedy's lower limbs were seriously bruised and lacerated at the time and grave fears were felt that complications might set in.

Mr. Kennedy has recovered sufficiently to resume his duties as vice president and general manager, and is able to spend several hours daily at his office. He will soon be fully recovered from all of the effects of the injuries received.

Scrap Prices

Are Advanced in Some Centers, But Still Drag in Others

New York, July 13.—A general swing toward better prices has been taken by the old material market during the past few days and a fair tonnage has been done at the advanced level. As is usually the case under such conditions, however, material is not being released very freely, as holders have before them the possibility of even higher prices. Most all the grades in the list are quotable 25 to 50 cents higher. Philadelphia brokers have been bidding up the heavy steel market in this territory, with offers of $9.75, New York. Dealers covering old contracts have been doing so at $9.50 to $9.60, New York. The heavy steel market seems solidly at $12, minimum, delivered eastern Pennsylvania. Heavy cast, after its recent activity, is quieter.

Old Material Market Better

Philadelphia, July 12.—A stronger condition of the old material market in eastern Pennsylvania territory recently established, now appears to be extending itself. Buying is enlarging and prices have shown additional rises in a number of grades. Heavy melting steel is strong at $12, delivered, at which several thousand tons have been purchased by two or three works as reported a week ago. Not all the tonnage these buyers desired was obtained, as sellers are committing themselves only on limited quantities. Some of these consumers still are in the market at $12, delivered, and brokers also are offering that figure. Fair sales of wrought pipe at $11, delivered, or 25 cents higher, and of turnings at $9, delivered, also 25 cents up, were made in the week. Some offers of $9 for turnings are open. Car wheels are quotably higher. The demand for cast is good. A sale of several hundred tons of low phosphorus brought $14.75, delivered. Dealers here who quoted on the recent offering of 27,000 tons of Panama scrap by the government, have received no advices regarding the distribution.

Scrap Stiffens

Pittsburgh, July 13.—Leading consumers of iron and steel scrap show no interest in the present market, but dealers have advanced quotations all along the line, believing more satisfactory conditions enjoyed by finishing mills warrant higher prices for old material. Heavy melting steel is being held at $12.50 by some dealers. A difference of opinion is expressed about the market for low phosphorus scrap, which is named at a spread from $15.25 to $16 by buyers and sellers in western Pennsylvania.

Cleveland Scrap Dull

Cleveland, July 14.—Midsummer dullness, inventory season, abnormal supplies, all contribute their quota to the lack of eagerness on the part of mill consumers to enter the scrap market. Buying continues extremely light in this district. The iron and steel old material trade expresses cheerful views as to the immediate future, but considers the slowness with which scrap is reflecting the improvement in finished lines remarkable. Valley mills which recently came into the pig iron market for large tonnages of steel making grades have been buying little scrap, but are believed to have large stocks on hand.

Outlook Better

Cincinnati, July 13.—The more optimistic feeling that has prevailed in the scrap market for several weeks has not brought out any business, and transactions are still very low and limited to small lots. Dealers are basing their predictions for better business in the near future on the advances on finished materials. Rolling mills continue to take good tonnages on old contracts, but jobbing foundries are buying very sparingly. Prices are unchanged on all grades of old materials.

Scrap Prices Firm

Chicago, July 13.—Scrap prices, especially in the heavier grades of steel, are much stiffer and advances have been made in a number of items. This is not brought about so much by actual trading as by the sentiment engendered by increased activity of steel mills which brokers feel must result shortly in heavy buying.

Railroads are offering considerable tonnages, the C., M. & St. Paul having out a list containing 1,200 tons, the Soo line 400 tons, the Belt Railway of Chicago 300 tons, the Chicago & Alton 500 tons, the Monon Route 450 tons, Northern Pacific 1,600 tons, Michigan Central 2,200 tons, Union Pacific 1,800 tons and the Southern railway 5,000 tons. The latter list does not directly affect this market.

Advances at St. Louis

St. Louis, July 10.—The scrap market is on the upward trend, and prices have advanced on nearly all items from 25c to 50c a ton. Several consumers recently have filled for their requirements for the next 60 days at the last advance, and the consumption of melting steel has increased rapidly, promising continuance of the trend.

(For complete prices see page 154)

Iron Ore Livelier

Several Large Deals Consummated—More Chartering of Vessels

Cleveland, July 13.—The iron ore market shows considerable increase in activity. A number of transactions have taken place, including one long-term contract and also a block of ore traded for a like amount of coal to be delivered at the head of Lake Superior. More trading of this kind is expected. Persistent rumors of price cutting on high grade as well as low grade Superior ores have some foundation, but it is believed that the cutting has been done principally by firms which have followed a similar policy in past years and that even they will soon withdraw their low quotations on account of the improvement in market conditions. Chartering of lake vessels is much more active.

The receipts at lake front furnaces for June were 978,072 tons, compared with 849,647 tons in June, 1914. The amount of ore on dock July 1 was 6,120,524 tons, compared with 6,197,463 tons on July 1, 1914.

Cutting on Lake Ores

Philadelphia, July 13.—Eastern Pennsylvania furnaces continue to be approached with some attractive price offers on Lake Superior ores, and old range non-bessemer of 47 per cent in iron has been offered on a basis slightly above 7 cents per unit of iron delivered in eastern Pennsylvania. This figures back about $1 a ton at lower lake ports below the official schedule. As previously noted, however, some of this ore is several points below the standard analysis. It develops that the recent sale of 20,000 tons of New Jersey ore to an eastern Pennsylvania furnace represents the clearing up of the stock at one of the inoperative mines. Operators of local New Jersey and New York state mines, now are holding prices more firmly and are quoting from 6¾ to 7 cents, delivered eastern Pennsylvania, on standard foundry ore.

Ore Receipts

Out of a total of 6,005,091 gross tons of ore shipped during June, 4,941,672 tons were received at Lake Erie ports, distributed as follows:

Port.	Gross tons.
Buffalo	621,263
Port Colborne	15,727
Erie	42,075
Conneaut	1,386,048
Ashtabula	946,437
Fairport	263,842
Cleveland	859,393
Lorain	596,293
Huron	96,785
Sandusky	.....
Toledo	67,125
Detroit	46,684
Total	4,941,672

Bar Mills Are Crowded

Promises of Delivery Extend From a Few Weeks to From Four to Five Months—Heavy Tonnages Pending

Philadelphia, July 13.—An eastern Pennsylvania maker who has been actively booking orders for steel rounds for shells has increased his orders within the past two weeks to over 10,000 tons and has an option outstanding on 4,000 tons additional. An inquiry is before makers here for the steel rounds to fill an order for 2,000,000 5 and 6-inch high-explosive shells which it is figured will require about 115,000 tons, delivery to be made at a weekly rate to extend over practically two years. Other shell stock is in the market here,

Further evidence of the heavily filled condition of steel bar makers generally is given by market conditions in this territory. Some of the leading middle-western makers now report that their mills have actual orders on hands to fill capacity six to eight weeks, and they are promising no deliveries under five or six weeks on ordinary sizes, while on large rounds shipments only are possible in a period of months. Some buyers in this territory have been inquiring for fourth quarter contracts on which they have been quoted 1.30c, Pittsburgh, or 1.459c, Philadelphia, and it is understood some business has been taken on that basis. An independent company is quoting 1.30c on the run of business for early delivery and has advised its agents to submit all tonnages for forward contracts. Early and third quarter bars are strong at 1.25c, Pittsburgh. New buying is limited, as most consumers are under contract and specifications are much lighter after the heavy rush around July 1. A Philadelphia contractor has taken a bridge for the Pennsylvania railroad at Manayunk, Pa., requiring 575 tons of reinforcing bars. About 500 tons additional for export have been booked in this district, usually at 1.20c, Pittsburgh, and makers now are talking higher. A lot of 225 tons of rivet rods which the government asked for Mare Island, Cal., delivery was abandoned.

Bar Iron Advanced

Philadelphia, July 13.—An advance of at least $1 a ton has been put into effect by eastern Pennsylvania makers of bar iron in response to a better volume of business. The minimum price for the commonest grades now seems to be 1.15c, mill, or 1.22c, Philadelphia, with some of the largest eastern Pennsylvania makers of common bars asking 1.20c, mill. On high grade iron bars, producers are quoting 1.30c, mill.

Shafting Held at 66 Off

Pittsburgh, July 13.—Leading makers of cold rolled shafting now are asking 66 per cent off for prompt and future delivery, the price announced several weeks ago by the Columbia Steel & Shafting Co. Shafting departments are operating at maximum capacity and indications are activity will be enjoyed the remainder of the year.

Demand for hoops and bands continues fairly heavy, but shipments are not deferred to any great extent.

Steel Bars May Advance

Chicago, July 13.—Heavy bookings of steel bars continue and an advance from 1.44c, Chicago mill, to 1.49c, Chicago mill, is fully expected to be announced within a few days. The same condition applies to practically all finished steel materials, as mills are well filled and both orders and specifications continue to come in large volume.

Bar Iron Steady

Chicago, July 13.—Bar iron mills are operating a trifle in excess of 60 per cent with conditions little changed from those that have existed for several weeks. Some encouragement for future tonnage is being received from wagon makers and others who find their business increasing and the probability is that larger specifications from this source will help tonnage materially. Bars remain firm at 1.20c, Chicago mill, without shading being apparent.

Advance Expected

Buffalo, July 13.—Mill agencies in Buffalo have been advised that on July 15 the principal interest is to advance prices on bars, shapes and plates from 1.25c to 1.30c for current requirements. The independent interests, however, are still quoting 1.25c for third quarter needs, but may later follow with the advance, as the whole market situation is developing strength.

The mills are reported filled up with orders and deliveries are becoming more extended. The leading interest reports that three to four weeks is the best obtainable on desirable tonnages of shapes and plates, while in bar material the deliveries vary at present from two to three weeks on the smaller sizes and three to four weeks on the larger sizes. In large rounds, the deliveries have become extended to five and six months in some quarters.

(*For complete prices see page* 154)

Spelter Market

Shows Decrease in Demand—Reaction in Copper

New York, July 13.—Some of the metals now are showing a reactionary tendency. This is especially the case with copper, for which the demand has been dull all along lately. None of the first hands now are asking more than 20.25c, delivered 30 days, and others will sell freely at 20c, and probably even less could be done. Second hands freely offer electrolytic in limited tonnages at around 19.25c, cash, New York. The best casting copper is held at around 19.50c to 19.75c, delivered 30 days, while ordinary casting can be had at 18.12½c to 18.25c, cash. The best grades of lake copper are quotable at 21.50c to 22c, cash. Ordinary lake can be had from producers at around 20.25c, cash, and arsenical lake at around 20.12½c, cash; second sellers offer limited tonnages at concessions.

A good deal of business was transacted in the spelter market last week at higher prices. The buyers were principally the brass mills, which bought large quantities of prime western, and also the better grades. Galvanizers bought some prime western for nearby shipment, but very little for future delivery. Demand has fallen off this week and prices again have sagged off, although it is certain that not much metal could be bought at these lower prices. Prime western is quoted nominally at 22c to 22.50c, for spot, 21.50c to 22c for July, 21c to 21.50c for August, 19.50c to 20.50c for September, and 19.50c to 20c for the balance of the year. Brass special is quotable at 25c to 26c for nearby shipment, and 24c to 25c for futures.

Although producers are adhering firmly to their quotations on lead, the market is lower by reason of concessions offered by second sellers. These interests quote around 5.65c to 5.70c, New York, and 5.55c to 5.60c, St. Louis, and it is understood scattered tonnages are being sold at this level. The price of the American Smelting & Refining Co. continues 5.75c, New York. Independent producers quote 5.75c to 5.77½c, New York, and 5.67½c to 5.72½c, St. Louis.

The tin market has been quiet during the week. Today there is some weakness in spot, due to low resale offers on tin just arrived or due.

Money and Iron: Fact and Comment

Stock Market Shows Ability to Absorb American Securities Sold By Foreign Holders

THE depressing effect on American stocks due to the floating of large European loans was again the most important factor of the market last week. This was shown particularly in railroad stocks the latter part of the week, when Louisville & Nashville and other southern railroad stocks suffered severely. The recent action of French bankers in borrowing $40,000,000 from American bankers at 5 per cent, with mortgages on American railroad properties as collateral has been a prominent factor in bringing about the selling of high grade railroad stocks. It is not easy to trace the effect in this country of the subscription of three and one-half billion dollars to the new English loan, but undoubtedly considerable amounts of American securities have been sold in order to permit subscriptions for the English loan. The offering of British treasury bills in the United States will also have the tendency of stimulating the selling of securities. There is, however, nothing alarming in these latest developments, and on the whole the American security market is showing remarkable ability to take care of new conditions as they arise. The latest German note, although regarded as highly unsatisfactory, was written in such a friendly tone that those who do not agree with its propositions do so in a good natured way.

Quotations at the close of business July 10 and changes in the leading industrial stocks identified with the iron and steel industry for the week are shown in the following table:

Amer. Brake Shoe & Fdy. Co., ctfs	103	—1
Amer. Brake Shoe & Fdy Co., ctfs., prfd	155	—2½
American Can	45⅞	— ⅛
American Can, prfd.	100	—2⅛
Amer. Car & Fdy. Co.	52½	—1½
Amer. Car & Fdy. Co., prfd.	114	+ ½
American Locomotive	44½	—3½
American Locomotive, prfd.	96¼	— ⅜
American Steel Foundries	35⅛	—1⅞
Baldwin Locomotive	67	+ ½
Baldwin Locomotive, prfd.	101⅜	— ⅜
Bethlehem Steel	167	+ ½
Bethlehem Steel, prfd.	117	+1
Colorado Fuel & Iron	30⅛	— ⅛
Continental Can	64¼	—2¼
Continental Can, prfd.	99	—1
General Electric	162	—5¼
International Harv. of N. J.	97½	— ¾
Inter. Harv. Corp.	60	—3½
Inter. Harv. Corp., prfd.	...	...
Nat'l. Enamel'g. & Stamp. Co.	16	—1
Nat'l. Enamel'g. & Stamp. Co., prfd	...	...
Pressed Steel Car	45	—3
Pressed Steel Car, prfd.	...	...
Pullman Palace Car	155⅛	—2⅛
Republic Iron & Steel Co.	28¾	— ⅛
Republic Iron & Steel Co., prf.	87⅛	...
U. S. Cast Iron Pipe & Fdy.	...	...
U. S. C. I. Pipe & Fdy., prfd.	37	...
United States Steel	59⅛	— ⅛
United States Steel, prfd.	109⅛	— ¼
Westinghouse Mfg.	97	—1¼

Wire Company is Bankrupt

National Mfg. Co., wire goods, Worcester, Mass., which asked an extension from its creditors last April, has filed a voluntary petition in bankruptcy in the United States district court in Boston, Mass., disclosing liabilities of $152,032 and assets of $116,579. The plant has been under attachment since March 19, during which time the business has been conducted on a hand-to-mouth basis. At the time the extension was asked the business was placed in the hands of Henry A. Hildreth, Boston, a former treasurer, who discovered after two months of operation that it would be useless to continue. The outcome will probably be that the business will be sold and continued by a new company to be organized, as it has a successful history of nearly 50 years and the plant is considered too valuable to be abandoned. The first meeting of the creditors has been called for July 16, when a trustee will be elected to take charge of the business.

Trumbull Steel Co.'s Plans

Stockholders of the Trumbull Steel Co., Warren, O., will vote Aug. 6 on increasing the capital stock from $2,500,000 to $4,000,000, half of the increase to be in common and half in 7 per cent preferred stock. After the increase the common stock will amount to $2,250,000 and the preferred to $1,750,000. The company was incorporated in April, 1912, and its plant began operating in November, 1913. It manufactures sheet and tin mill products, tin and terne plate, genuine charcoal iron ternes, black and galvanized sheets, flat and corrugated long terne sheets and formed roofing products of every description. The increase will be used to add materially to the company's sheet and tin mill capacity and will enlarge working capital. The company was originally capitalized at $1,000,000 common and $250,000 preferred, but this was increased to $1,500,000 common and $1,000,000 preferred in May, 1914, to provide means to install 12 additional sheet and tin mills.

President J. Warner has sent a letter to stockholders relative to the proposed increase in the company's capital stock in which he gives in detail the terms under which the issue will be made. He says in part:

"The plant of this company was substantially completed about Aug. 1, 1913, but was not placed in full operation until about Nov. 1, of the same year. Since that time, additions to the plant have been made which have practically doubled its capacity. Notwithstanding the fact that construction work has been going on practically during the entire time that the plant has been in operation, the effect of which has been materially to increase the overhead expense, and to interfere more or less with the successful operation of the plant and notwithstanding the depressed business conditions that have prevailed in the sheet and tin plate business during the past two years, resulting in a corresponding low level of prices for our products, I am pleased to report that the operation of the plant in the main has been very satisfactory.

"The company not only has earned and paid its preferred stock dividends, but in addition thereto has made very substantial earnings applicable to the common stock. In the opinion of the board of directors of the company, the present business outlook is such as to justify further extensions to the sheet and tin plate capacity of the company. It is believed that this construction can be made perhaps more cheaply now than subsequently, and that the additional capacity can be operated without proportionately increasing the overhead operating expense. Furthermore, the proposed additional mills can be installed without interfering with the operation of the plant as heretofore, and without necessitating the installation of additional boiler and engine capacity. It will not be necessary to acquire any additional lands, as the present site of the company is amply sufficient, not only for the present proposed extensions, but also for further extensions in the future, if desired. If the proposed increase of stock is authorized by the stockholders, it is the purpose of the board of directors to offer the increase of stock, both common and preferred, to all the present stockholders, common and preferred alike, for joint subscription in proportion to the amount of stock at present in their possession."

Large Orders

For Steel Rails Have Been Placed by Russia

Two independent companies have booked a large Russian rail order. Cambria gets 100,000 and Lackawanna 60,000 tons.

There are more promising reports in domestic car buying, these having to do with the New York Central and some other systems, but the inquiry increases rather slowly. The Texas Pacific asks 400 general service cars; the H. C. Frick Coking Co., 400 mine cars; the Chesapeake & Ohio, 50 cabooses; the Virginia Iron, Coal & Coke Co., 50 mine cars; the Jacob Dold Packing Co., 25 refrigerators, and the International & Great Northern, 15 all-passenger types. The Wabash is out for 1,600 center constructions.

An eastern road has ordered 2,500 tons of rails of the Bethlehem Steel Co., and the Norfolk & Western has given the Cambria Steel Co. 1,000 tons additional. The Southern Pacific has ordered some 140-pound girder rails of the Pennsylvania Steel Co. The public service commission of New York will take bids July 28 on 3,000 tons of manganese rails for subway extensions, which is in addition to the approximately 40,000 tons of running rails to be bid upon July 16. It also then will take figures on 1,000,000 tie plates and about 150,000 splice bars.

Wage Advance

The bi-monthly examination of bar iron sales sheets of selected mills at Youngstown, July 12, developed a 1.10c card, making the wage scale $5.70 a ton for July and August in mills affected by the Amalgamated Association of Iron, Steel and Tin Workers. The last previous examination developed an average of 1.05c, which gave puddlers a rate of $5.60 a ton.

The Bradford Machine Tool Co., Cincinnati, is now owner of the property it occupies, having recently paid the balance of the purchase price of $30,000. The company is erecting a new office building.

The Mesta Machine Co., Pittsburgh, has received a contract for 12 stands of cold mills, two pickling machines and a bar shear, for installation in the plant of the Standard Tin Plate Co., Cannonsburg, Pa., which is adding 12 new mills. The Hyde Park Foundry & Machine Co., Hyde Park, Pa., will furnish the hot mills and the Shaw Electric Crane Co., New York, will install four 10-ton cranes.

More Plants

Ordered in by Corporation—Rushing New Construction

New York, July 14. (By wire.)—The full steel works capacities of various leading makers are now being strained. The Corporation is running at 90 per cent of ingot capacity, only several per cent below the theoretical full capacity, and is putting on further capacity. The plants of the Riverside works of the National Tube Co., consisting of two blast furnaces and a bessemer plant are ordered in immediately. The construction of the new Duluth works has been speeded up. This plant will make steel, about 30,000 by the middle of November. The blast furnaces now are about ready. Originally it was figured this plant would be running early next year. Additional furnaces at Central, Lorain, Isabella, South Chicago, are ordered in. The Bellaire furnace will be rebuilt. The Corporation to date has purchased in the market about 75,000 tons of open hearth billets, most of which has been placed with eastern works. It is not likely any pig iron will be bought, as furnaces now are only 80 per cent active.

New bookings are very heavy and are maintaining the June rate, which was about 50,000 tons daily. The June shipment was about 40,000 daily. Foreign business is about 10,000 daily.

Crane Stack Resumes

The Empire Steel & Iron Co., Catasauqua, Pa., has resumed operations at its No. 1 Crane furnace at Catasauqua, which had been banked for the past six months. Despite the long inactivity, the furnace within a week from the time it last was applied, was making iron of the usual quality and now is operating normally on high grade foundry iron. The Empire company also is operating its Oxford furnace at Oxford, N. J., on basic iron. This furnace on the present blast already has made approximately 250,000 tons of iron, which much exceeds all previous records in New Jersey for a single run. The No. 3 Crane furnace has been relined and placed in shape for early resumption. The ore mines of the company at Mount Hope, N. J., and Oxford, N. J., now are being operated at fullest capacity and are producing an average of 30,000 tons monthly of material assaying 60 per cent in iron.

(For complete prices see page 154)

Spotting Charges

Are Disapproved by Interstate Commerce Commission

Washington, July 13.—Spotting tariffs filed with the interstate commerce commission by railroads in official classification territory have been ordered stricken from the commission's files by July 15. In an opinion yesterday, the commission said the tariffs have not been justified. The railroads, however, may file new tariffs providing for spotting in instances where the terminal services performed exceed services which, under established custom, are or should be performed for the line haul. Many steel companies were included in the list of protestants who attacked the tariffs. They proposed a charge of 5½ cents per 100 pounds, with a minimum of $2 per car for placing cars at spots where loading or unloading was to be done. Had they become operative, the charges would have been tremendous for big industrial concerns, such as the steel interests.

Latest Rules

To Guide Railroads If They Are Common Carriers

Washington, July 13.—Steel plant railroads which can establish themselves as common carriers will be granted allowances from trunk line carriers. Those which perform only plant service will not be allowed to maintain joint rates and through routes with trunk lines. The interstate commerce commission laid down these rules in its second opinion in the industrial railways case, rendered last Saturday. The finding is similar to that in the supplemental opinion handed down in connection with the original industrial railways case.

Contract for Snyder Furnace

The Chicago Bearing Metal Co., Chicago, has contracted for the installation of a Snyder electric furnace for melting brass. This furnace will have a 12-hour capacity of 5,000 pounds. It is to be installed under guarantees as to operating cost and loss by volatilization. Losses by volatilization in oil-fired furnaces form one of the largest melting expenses. The Snyder Electric Furnace Co., Monadnock building, Chicago, is willing to guarantee that the loss by volatilization in Snyder electric furnaces will not exceed 1½ per cent and it claims that in actual operation the loss will run well below this guarantee.

Domestic Demand is Improving

In All Parts of the Country, But Heavy Tonnages of Many Products Are Still Due to War Requirements

Pittsburgh, July 13.—Positive evidence of very encouraging improvement in domestic demand is furnished by the Pittsburgh district. Col. H. P. Bope, vice president of the Carnegie Steel Co., says that decided improvement in the domestic situation has been under way for several months and officials of leading independent companies offer similar testimony. One of the largest independent steel bar manufacturers is not making any material for shells. This company is operating at 85 per cent of capacity and fully 70 per cent of the orders are from domestic consumers, most of whom, it is believed, are not shipping abroad to any extent.

The bulk of the business of the American Sheet & Tin Plate Co. is purely domestic. Automobile builders are taking heavy sheet tonnages. Car builders are specifying more briskly and electrical concerns, such as the Westinghouse and General Electric, are beginning to take normal requirements. It is predicted that July will run ahead of June, the best month in two years for specifications. Fairly heavy demand for tin plate for export has come out recently, but a very large percentage of the tin plate tonnage is going to domestic consumers.

According to some conservative estimates, only about 15 per cent to 20 per cent of the output of wire mills in this district is being shipped to foreign countries. Specifications for all kinds of wire material for export are coming out in good volume. The domestic situation reflects decided improvement, although the nail market continues to drag to some extent. Prices announced the early part of the month by the American Steel & Wire Co. are being quoted by all makers in the district.

While heavy tonnages of steel bars are being used for the manufacture of war material, yet there is reason for mill managers to express satisfaction over the domestic situation. Shipments of small sizes of rounds, used exclusively by the domestic trade, are from two to eight weeks deferred and new orders are coming out in good volume. Agricultural implement makers are specifying more briskly and general domestic demand is similar to that of 1912, according to frequent expressions. Mills, rolling larger sizes of rounds, are unable to promise material in less than three or four months, in some instances. The Carnegie Steel Co. is operating finishing mills at practically maximum capacity and independent plants are running from 75 to 85 per cent of nominal capacity.

Domestic Trade Increasing

Philadelphia, July 13.—That strictly domestic steel trade has increased and is continuing to increase, is the common opinion of all eastern Pennsylvania steel makers. They all can point to indications and evidence in their business to prove this fact, particularly to the many miscellaneous sources in which the orders are originating. But when it comes to dividing the total volume into that portion which is due directly or indirectly to the European war and that which is not, even remotely so, and to fix the gain in purely home business, no two will agree and, in fact, few will attempt the operation. The truth seems to be that the European war, followed to the ultimate end, is the overwhelming stimulus and moving cause of the present broad activity of the eastern industry, as it seems also to be of the industry of the whole country. As an example, the expansive ship building activity on the Atlantic coast is due, in a large measure, to the scarcity of vessels of belligerent nations on the high seas, though some of it undoubtedly would have been brought about by the Panama canal, without the war. Certain eastern plate makers who will not accept direct war orders under any circumstances, either in this country or abroad, now are running practically full without a pound of direct material for battle, yet it is realized that in their orders must be included a considerable tonnage that would not have been needed but for the far-reaching effects on general industry of the war.

The eastern Pennsylvania steel industry is active at about 80 to 90 per cent on the average. Some of the eastern shape mills figure that about 40 per cent of their business is due to orders for the extension of plants manufacturing war munition. The remainder is for the ordinary domestic trade. This latter is some improvement over several months ago, but it is slight. This seems to be a fair measure of the situation. It indicates that while there has been some gain in domestic business, it has been small proportionately and that without the stimulus of the far-reaching effects of the war, the steel industry would not be much better than it was a year ago or before the European conflict. The situation is well illustrated in pig iron melt. Improvement among the foundries in this district is not general and is very spotted. Those plants filling direct or indirect war supplies are very busy, while the shops depending solely upon what demand the country produces within itself have been able to improve their operating position only moderately.

Largely War Orders

St. Louis, July 13.—Interviews with local steel foundries, rolling mills, dealers in iron, steel and scrap, revealed the fact that business shows no general improvement except with such plants as are filling war orders for European countries.

Home Business Better

New York, July 13.—New York City has been the hub center for so much purchasing of iron and steel for war needs that these demands have tended to obscure consideration of purely domestic trade conditions, and something of the same situation still obtains. But it is becoming more evident to steelmakers, particularly in recent weeks, that home business in no way related to European needs is beginning to expand in a more hopeful manner. There had been some betterment prior to recent weeks, but it in reality had been so small, compared with that which was the result of war orders, that it had attracted scant attention.

The New York territory within itself ordinarily is a large market for structural steel. Despite the larger war plant extensions handled here and the extraordinarily heavy rapid transit requirements, which have been going forward steadily, the miscellaneous building tonnage has been lagging. Now a noticeable improvement in this direction seems to have set in. The tonnage being bid upon and that let is heavier and the abundance of money seems to be producing its effect. Manufacturing consumption of iron and steel by plants in this territory working on purely domestic business

is heavier and shows an inclination to grow. With it all, however, the appreciation remains that it is the war business direct and indirect that is sustaining the present activity of the mills and that domestic trade in itself still is a minor factor in the situation.

Machine Tools for War

New York, July 13.—The great activity and the sold-up condition reflected in the machine tool market, continue to owe their origin almost entirely to the war. Leading machinery dealers and manufacturers say that while purely domestic business is improving, it is by no means near normal. In fact, until a week or two ago, when there began to develop what looks like a railroad buying movement, feeling in regard to domestic business was not nearly as cheerful as it had been a month or two before. This is due to the fact that hopes previously entertained failed to materialize and also because, in many cases, business which had a purely domestic aspect proved, on investigation, to be an indirect result of the war. Machinery concerns doing a country-wide business are inclined to believe this domestic business is better in the east than in the remainder of the country, but this condition probably is an indirect result of the war business, since the east is more active in the production of war munitions than the west.

Domestic Demand Heavier

Cleveland, July 13.—In the Cleveland district, the office of one large independent steel company, whose plants are in Pennsylvania, reports that not 10 per cent of its recent specifications has been for war material of any kind. The company is very busy in turning out purely domestic business and reports that the demand from automobile companies which are not catering to the automobile trade is very heavy. The testimony of some other companies as to the improvement in domestic business varies somewhat, but the best judgment seems to be that, particularly during the last two weeks, the improvement has been due very largely to demand from consumers in the United States. A striking illustration is found in the decided change for the better in nuts and bolts and makers say that very little of this new business is for export. Greater activity in sheets, strong demand for small angles and other features indicating increased business are traceable largely to home consumption.

One keen observer has pointed out that the tonnages going into munitions have been considerably exaggerated and could not possibly account for the heavy increase in production and demand of iron and steel products.

Railroads Have Helped

Chicago, July 13.—Just how large a proportion of the increased activity in the steel market is due to domestic demand is difficult to determine. The general opinion is that the backbone of the present tonnage is for war material and much that is not directly for war munitions will be used to meet demand indirectly caused by European hostilities.

Resumption of buying on the part of railroads, which have taken considerably increased tonnages of rails, track fastenings and cars, has given the greatest impetus to domestic demand, although other lines have followed in some degree.

The fact that pig iron and bar iron have not advanced in demand or prices as rapidly as finished steel products is perhaps the truest test on domestic demand. Neither of these products is exported in any quantity nor in demand for war products directly. Neither has advanced in any degree parallel with steel and perhaps it would be fair to assume that the steel market would be in the same condition were it not for the unprecedented demand for export brought about by the war.

Russian Order for Cranes

The Brown Hoisting Machinery Co., Cleveland, has taken an order for 38 locomotive cranes for shipment to Russia. Arrangement for payment has been made in an entirely satisfactory way and the cranes will be shipped rapidly. Another Cleveland company which recently took an order for 32 cranes for shipment to France has taken an additional order for 10. In this case, the original order was delayed somewhat on account of inability to make satisfactory arrangements for payment, but this matter has been adjusted and shipments will begin at an early date.

Death of H. B. Anderson

Harold B. Anderson, chief engineer of the Winton Motor Carriage Co., Cleveland, was dashed to death at the Superior viaduct, Cleveland, July 13, when the automobile which he was driving collided with a street car. Mr. Anderson was 35 years of age and was a member of the American Society of Mechanical Engineers the American Society of Automobile Engineers and the Cleveland Engineering Society.

Blast Furnace

Will Be Built by United Steel Co.—Also Coke Plant

The United States Steel Co., Canton, O., has decided to build a blast furnace with a capacity of 400 tons per day at its plant in Canton. It will also erect Koppers by-product ovens of sufficient capacity to meet the requirements of the furnace. Pickands, Mather & Co., Cleveland, have become associated with this enterprise.

Slag Charge

Will Be Made on Intrastate Business By Railroads

Announcement has been made by railroads serving steel mills and blast furnaces in Ohio, western Pennsylvania and West Virginia that they are preparing to file with the utilities commissions of those three states tariffs proposing a charge of 20 cents a ton for hauling slag. It is assumed that they will also soon file similar tariffs affecting the same territory with the interstate commerce commission. The federal commission, in its recent slag rate decision, said that if the railroads would file tariffs complying with the act they would be given consideration and, it is believed, will be allowed to become operative.

The railroads apparently are preparing to file the tariffs with state commissions to meet opposition from the steel interests which at the hearings at Washington contended that the commission there was without jurisdiction because 90 per cent of the slag movement is of an intrastate character. The steel interests maintained that the commissions of the states involved had sole jurisdiction. It seems evident that the case will be vigorously fought before the state commissions and this gives an interesting angle to this situation. For instance, it has been pointed out that if one state commission should order the slag tariffs canceled, the commission of an adjacent state would be almost compelled to do likewise in order to protect the industries of its state. Obviously if furnaces and mills in one state were charged for hauling slag and those of an adjoining state were not the former would be placed at a distinct disadvantage.

Tariff Suspended

Pittsburgh, July 14. (By wire.)—The public service commission of West Virginia has suspended slag tariffs in that state until Nov. 10.

Results of Factory Standardization

A Summary of the Methods Employed by a Large Electrical Manufacturer to Reduce the Cost of Production

BY CARL BENNETT AUEL

THE subject of this article covers so broad a field as to preclude its being handled within the confines of a single discussion, in any but the most fragmentary manner. Accordingly, in what follows, which is a brief outline of a few of the ways and means employed by the Westinghouse Electric & Mfg. Co., in its work of standardization, no reference will be made to the standardization of the company's products. Rather will attention be directed to a description of certain methods and processes which it is hoped may prove of interest to manufacturers in general, regardless of their particular field.

In the early days of the Westinghouse company, it was the custom to make all drawings for apparatus as complete and self-contained as possible. Opposite each item a note was placed specifying the material required to manufacture it. When drawings for new apparatus were made and any of the old parts could be used, these parts were shown again on the new drawings in complete detail so that the workmen would not have to refer to any other drawing. Such a system was admirable from the standpoint of the workmen; but, it is obvious that errors could be and were committed in transferring old parts to new drawings, and considerable time was required for such reproduction; furthermore, variations occurred in the copying process, due either to the ideas of the individual designers or to the fact that they were unable to locate drawings showing the old parts.

Presented at the annual meeting of the American Society of Mechanical Engineers.

Compromise Adopted

With the development of the electrical art, this method of making drawings was found to involve more and more a duplication of drafting and clerical work, for the reason that the newer apparatus, though differing from the older apparatus when completed, had nevertheless an increasing number of pieces or parts in common. The scheme of making elemental drawings, that is, making but one piece on a drawing, was next considered; but, while this would insure the greatest accuracy in the duplication of a piece at any time, it has the disadvantage that there are too many drawings to handle, an especially serious matter when the apparatus is at all complicated. A compromise arrangement was therefore adopted, consisting of a natural grouping of pieces or parts on a single drawing. Each piece is assigned an item number and a list of the material involved is located conveniently on the drawing, arranged numerically according to item numbers, as shown in Fig. 4. In the absence of recognized standards, the company arbitrarily fixed upon four sizes of drawings, the smaller being subdivisions of the larger. All blueprints from these are not only made by machine but are further washed, as well as dried by machine, many being also ironed, and are issued to the works unmounted. Fig. 1 shows a standard drawing of a line of wing nuts, arranged, however, in such manner that the various items may be cut into cards and issued to the workmen who can attach them to the belt-shifters of their machines while working. It might be suggested that a simpler form of drawing would consist of one picture only, each part being lettered, a statement immediately below containing the differing dimensions of each size of nut. While this is true, experience shows that with tabulated data of this kind, there is a decided tendency for the workmen to misread dimensions, taking perhaps one of them from the line immediately above

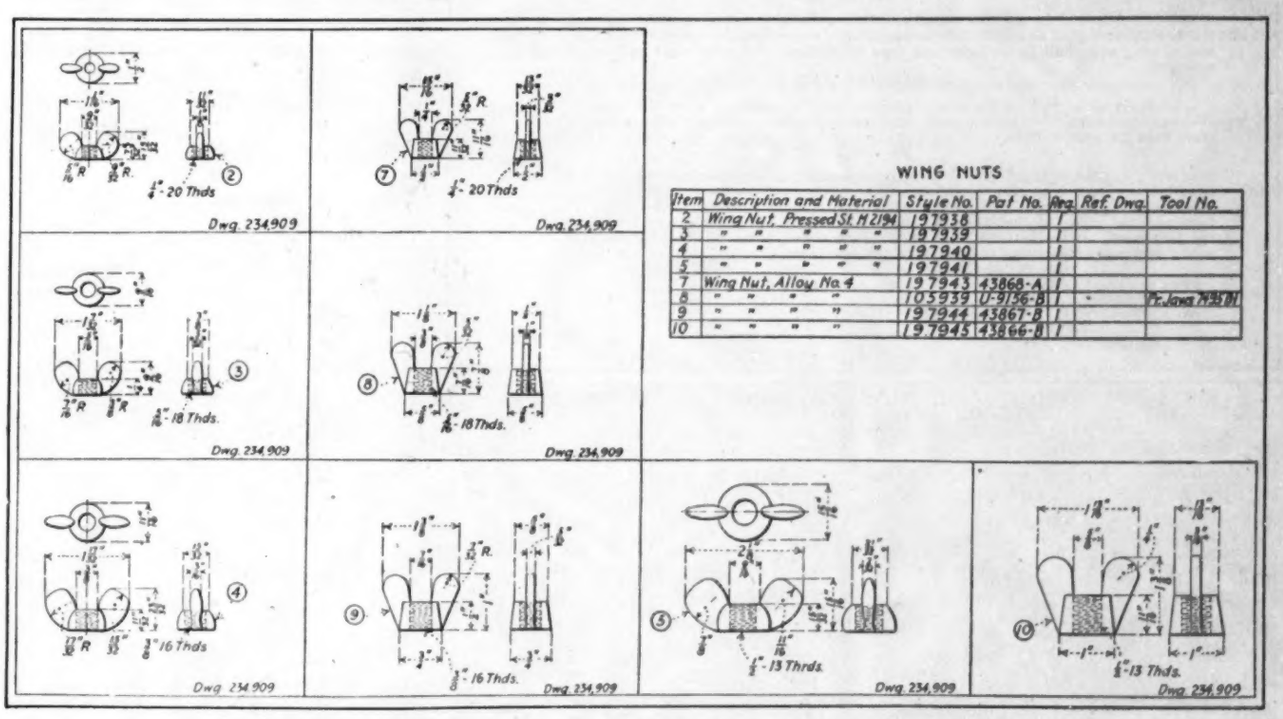

WING NUTS
Item | Description and Material | Style No. | Pat No. | Req. | Ref. Dwg. | Tool No.
2 | Wing Nut, Pressed St. H 2194 | 197938 | | 1 | | |
3 | " " " " " | 197939 | | 1 | | |
4 | " " " " " | 197940 | | 1 | | |
5 | " " " " " | 197941 | | 1 | | |
7 | Wing Nut, Alloy No. 4 | 197943 | 43868-A | 1 | | |
8 | " " " " | 105939 | U-9136-B | 1 | " | Pr. Jaws 43881 |
9 | " " " " | 197944 | 43867-B | 1 | | |
10 | " " " " | 197945 | 43866-B | 1 | | |
20 Thds
Dwg. 234,909
18 Thds.
16 Thds
13 Thds.

FIG. 1—SECTIONS OF STANDARD DRAWING OF A LINE OF WING NUTS

or below the proper line. As would be expected a very complete reference index is maintained, so that the danger of duplicating items is reduced to a minimum.

All apparatus and parts are built to so-called manufacturing information. This consists of a specification setting forth the drawings to be worked to, with a list of the various kinds and amounts of material required. Copies of such portions of these specifications only, to which is assigned a style or catalog number. By this arrangement when standard apparatus or parts are wanted, orders may at once be forwarded to the works, simply by reference to the style number and without being sent to the engineering or drafting departments for information, thus avoiding a useless burdening of these departments as well as saving considerable time in the ordering of the material and in the prompt commencing of work.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

Purchasing Department Specification No. 1556-B
(Not for Publication)

COLD DRAWN STEEL (AUTOMATIC SCREW STOCK)

1—The material desired under this specification is a free cutting steel of any specified section, suitable for high speed screw machine work, leaving a smooth finish after being machined.

I—MANUFACTURE

2—The steel shall be made by the Bessemer process. **Process**

II—CHEMICAL PROPERTIES

3—The chemical analysis shall be as follows: **Chemical Composition**
Carbon, .08% to .16%.
Manganese, .60% to .80%.
Phosphorus, about .10% not more than .13%.
Sulphur, .09% to .15%.

4—Samples for analysis shall be taken in such a way as to represent the average of a full section of one or more bars. **Test Samples**

III—DIMENSIONS

5—The variation from the specified diameter or distance between parallel faces shall not exceed the following limits: **Permissible Variations**

	Over Size	Under Size	Variation from True Section
Up to ½"	.001"	.002"	.001"
½" to 1¼"	.001"	.002"	.002"
1¼" to 3"	.001"	.003"	.002"

6—Ordinarily the material will be ordered in 10 foot lengths, with allowable variations as follows:
At least 70% shall be 10 feet long, 30% may be furnished in shorter lengths, but no rod shall be less than 8 feet long.

IV—FINISH

7—All rods shall be cold drawn, so as to leave a bright, smooth surface.

8—The rods shall be free from injurious defects, such as cracks, rough surfaces, seams, etc., and shall be straight and true to section. No crop ends will be accepted. **Finish**

V—PACKING AND MARKING

9—Rods up to ⅝ inch diameter, inclusive, or other sections up to the same cross-sectional area (.307 square inch) shall be shipped in bundles weighing not more than 125 pounds each. **Packing**

VI—REJECTION

10—The Westinghouse Electric & Manufacturing Company reserves the right to reject any portion or all of the material which does not conform to the above specification in every particular, and to return the rejected material to the manufacturer or seller for full credit at price charged f.o.b. point of delivery specified by the purchaser. If the material is to be replaced, a new order will be entered at prices, terms and conditions acceptable to the purchaser. **Rejection**

Approved, June 18, 1906
Revised, November 8, 1912
Revised, February 12, 1913
Chief Engineer.

P. D. Spec. 1556-B

FIG. 2—STANDARD SPECIFICATIONS COVERING COLD DRAWN STEEL

and drawings as pertain, are issued to all departments having work to do in connection with an order, which specifications are closed when the order is completed. Exceptions are, however, made to this general procedure, for all apparatus or parts which have been standardized and the orders for which are, therefore, likely to be repeated. In such latter cases, the specification is issued to the manufacturing departments in permanent form but for a single unit only.

Materials used throughout the works are arbitrarily divided into two classes, productive and expense, the former entering directly into the manufacture of the company's products, the latter but indirectly; as examples of each may be mentioned axle steel for armature shafts and leather for machinery belting; occasionally, however, material may belong to both classes.

When either the quantity or the importance of the items warrant, specifications are carefully prepared for the purchasing and the inspection departments, who use them in the purchase and the subsequent inspection of such materials. These specifications frequently involve a great amount of work, not only in their original preparation but in the subsequent revision of them. As a rule the engineering departments prepare the specifications pertaining to productive items, while the manufacturing departments handle those representing expense items. A typical specification of this kind covering cold drawn steel for automatic screw stock is shown in Fig. 2, and it may be mentioned in passing that the general arrangement is in accordance with the standards of the American Society for Testing Materials.

It will be appreciated that this work is of the very highest importance; and similar work must be carried out faithfully by every industrial concern which values a reputation for uniformly high grade and consistent products. But this being admitted, it does seem as though there should long since have been taken in hand by some one or more of the prominent engineering societies, the preparation of such standard specifications, particularly for the more common and simple materials, which could be used throughout the country by manufacturers and others, thus avoiding some of the duplication of this kind of work at present going on among many individual manufacturers.

When quotations are received, either on new materials or from manufacturers whose goods have not previously been used, samples are generally required. These are subjected to such tests as may be deemed necessary; and if the results prove satisfactory, the manufacturers of the materials are placed on an approved or standard list from which the purchasing department is free to choose when placing orders.

Shop Processes

Another equally important line of work consists in the development of manufacturing processes and formulas which, when standardized, are recorded in permanent form and issued to the various manufacturing departments involved. In this way uniformity in product is assured, there is no needless repetition of lessons or experiences previously learned, and the company is made independent of any individual's knowledge. Both foremen and workmen take kindly to the process specifications and formulas, the former because, in many cases, they helped to originate them and appreciate that through such mediums they are relieved of some of the routine responsibility of manufacture, the latter for the reason that they are made acquainted with the best methods.

These specifications and formulas are, like the material specifications, revised from time to time as added experience, new equipment or other reasons dictate; and further like them, are made use of by the inspection department in checking the company's products during the course of manufacture. Fig. 3 shows a process specification covering the method of treating coils with insulating varnish.

Every one who has had to do with production, has felt the need of a means of portraying in some simple manner, the actual output of a department and of comparing it with past as well as with desired performance. To many shop men figures appeal more forcibly than do curves, since they are usually more readily understood; but it is believed those shown by Fig. 7 are so plain as to preclude any objection on such score. Curve *a* is the daily total of unfilled orders, machines or pieces obtained by adding to the total on hand, the number received each day and subtracting the number shipped. Curve *b* shows the maximum possible output of which the department is capable in a month. Curve *c* is the desired output for the same period. While these two latter are both straight lines, their shape could of course, be altered, though with a loss in simplicity. Curve *d* indicates the actual output and a comparison between it and curve *c* tells whether the department is working up to its schedule or falling behind. Curve *e* is that of actual daily deliveries. These load diagrams, as they are called, have been standardized and are used quite generally throughout the works, though there are, of course, certain departments where their use would mean but little.

Organize Standards Committee

Owing to the obvious need for having certain standard sizes and kinds of materials, including wire, screws, bolts, nuts, rivets, cotter-pins, sheet metals, finished parts and the like, the first steps in standardization naturally fell largely upon the drafting department. As the necessity for further standardization along such lines became apparent, the work was transferred to the engineering departments, where its scope was very much broadened; and, in order that full advantage should be taken of the results of such standardization, standard books and card indexes were prepared and placed in every department where needed. As the benefits of standardization were still further appreciated, a standards division of the engineering departments and a standards committee were created, whose functions are the standardization of existing materials and parts.

This work in nowise, however, interferes with or has to do with the development of apparatus as such. The standards committee has but two permanent members, a chairman and a secretary. Subjects which seem suitable for standardization either originate with the permanent members of the committee or else are called to their attention by various members of the engineering or manufacturing departments. Sub-committees whose members are drawn from the engineering, manufacturing, purchasing, storekeeping and other departments, are then appointed by the permanent chairman and furnished with instructions and suggestions pertaining to the work to be undertaken. The chairmen of these several sub-committees form the temporary members of the standards or main committee, which passes upon all reports presented by the sub-committees. As a report is accepted, the corresponding sub-committee is dissolved. The chairman of this committee at the same time ceases to be a member of the standards committee. The work of the standards committee has been varied in the extreme, such matters as punched circular washers, thumb and wing nuts, oil-hole covers and hinges, furniture, anchor holes in bearings, wood handles, sizes of tap drills, stresses in eye-bolts, thickness of babbitt in bearings, liners, trucks, etc., having been successfully handled.

No one, it is believed, will dispute the arguments in favor of standardizing cutting tools. Such work means not only increased and uniform production from machines of the same class, but it means also that savings are effected in the making of the cutting tools themselves and in the kinds and amounts of raw materials from which they are made. Fig. 6 shows the cutting tools that have been thus standardized.

There may, however, be some scepticism as to the feasibility of attempting

Westinghouse Electric & Manufacturing Company
Pittsburgh, Pa.

Process Specification No. 115094-A **April 13, 1914**

TREATING COILS WITH CRYSTAL INSULATING VARNISH

GENERAL

This specification covers the process to be followed in treating coils with Crystal Insulating Varnish.
The number of Varnish Treatments required will be specified in the Insulation Specification.

PROCESS

Operations:
Tinning
Singeing
Dipping Leads
Heating
Soaking
Draining
Baking
Sanding
Tinning

Tinning:
Tin the leads as per Process Specification 50615. Tinning is to be done only previous to the first varnish or gum treatment given to the coil.

Singeing:
Singe the coils all over to remove any fleece that would cause any roughness to the varnish coating.

Dipping Leads:
Dip the leads in plastic varnish (M No. 1781) until the cotton covering is thoroughly saturated Turbo coils, gum treated coils or coils that have been treated in plastic varnish previous to applying this process will not require this operation.

Heating:
Heat the coils in an oven at a temperature of 101-107° C. (215-225° F.) for one to one and one-half hours. This operation is to be done only previous to the first dip, and is to be omitted if the coils have had other varnish or gum treatments previous to applying this process.

Soaking:
Immerse the coils in Crystal Insulating Varnish (M-2229) and soak until all bubbling ceases (10 to 30 minutes). Keep the specific gravity of the varnish at .85. When thinning is necessary, use benzine.

Draining:
Drain the coils for thirty minutes at room temperature before placing in the oven.

Baking:
Bake the coils in an oven at a temperature of 101-107° C. (215-225° F.) for five to ten hours depending upon the size of coil and the number of dippings.

Sanding:
Sand the coil just before applying the last varnish treatment. The number of times to apply this varnish treatment will be specified in the Insulation Specification.

Tinning:
Re-tin the leads after the last varnish treatment has been properly applied.

Material	Material No.
Black Plastic Varnish	M 1781
Crystal Insulating Varnish	M 2230
Benzine	P. D. Spec. 1609.

Approved: .... Engineer 5/11 1914.
Accepted: .... Manager of Works 5/12 1914.

FIG. 3—PROCESS SPECIFICATIONS COVERING METHOD OF TREATING COILS WITH INSULATING VARNISH

the standardization of die and jig parts, etc., but the extent to which this can be carried, without overdoing it, will prove upon investigation, especially in a large shop, to be rather surprising. Fig. 5 is simply indicative of a few of the many items used in large quantities, and which have been found to lend themselves admirably to standardization. Among them may be noted dies and die shoes, punches and punch holders, punch and stripper plates, jig boxes and bushings, drill press chucks and shanks, etc. For shaft grinding machines, wheels are now purchased for the largest size and used with them until the diameter is reduced to a certain predetermined figure, when they are returned to the storerooms to be issued in due course, for use with the next smaller size of shaft grinder and so on. On milling machines, mandrels and collets have been standardized, and on lathes effort is now being put forth to standardize the spindles with respect to the diameters and the number of threads per inch so that chucks may be used interchangeably. Much more might be said along similar lines but enough examples have been given to indicate that standardization is possible to some extent at least, in what would be considered at first glance as a very infertile field. Endeavor has been made and with considerable success, in connection with certain classes of apparatus, to place on working drawings the allowable variations from drawing dimensions for standard parts. In most manufacturing establishments, it will be found that working drawings call for single dimensions only, and, as it is impossible to work to mathematically exact measurements, permissible variations are largely a matter of judgment on the part of the foreman, inspectors and workmen. As a result, it is obvious that work may at times be accepted which should be rejected and vice versa. Again, when uncertainty exists as to the advisability of passing material that varies from drawing dimensions, conferences of those interested are called to determine the question and as records are not usually made of the decisions reached, the same ground is liable to be covered again and again. This is especially true when changes occur in the personnel. Furthermore, with definite information as to the permissible variations from exact dimensions, both workmen and inspectors can work to better advantage in every way, there being no doubt as to what is wanted in the matter of accuracy. Such reasons as these were deemed sufficiently important to warrant the placing of limiting dimensions on drawings for standard parts. The method which has been adopted consists in placing the nominal dimensions first, followed by the limited

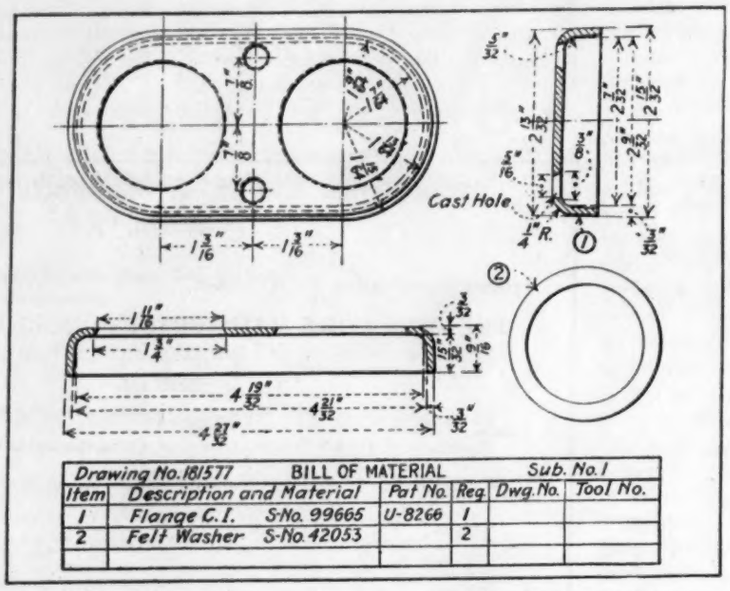

Cast Hole
1 3/4" R.
Drawing No. 181577 BILL OF MATERIAL Sub. No. 1
Item | Description and Material | Pat No. | Req. | Dwg. No. | Tool No.
1 | Flange C.I. S-No. 99665 | U-8266 | 1
2 | Felt Washer S-No. 42053 | | 2

FIG. 4—MERCURY RECTIFIER OUTFIT—DOUBLE FLANGE FOR TRANSFORMER PORCELAIN BUSHING

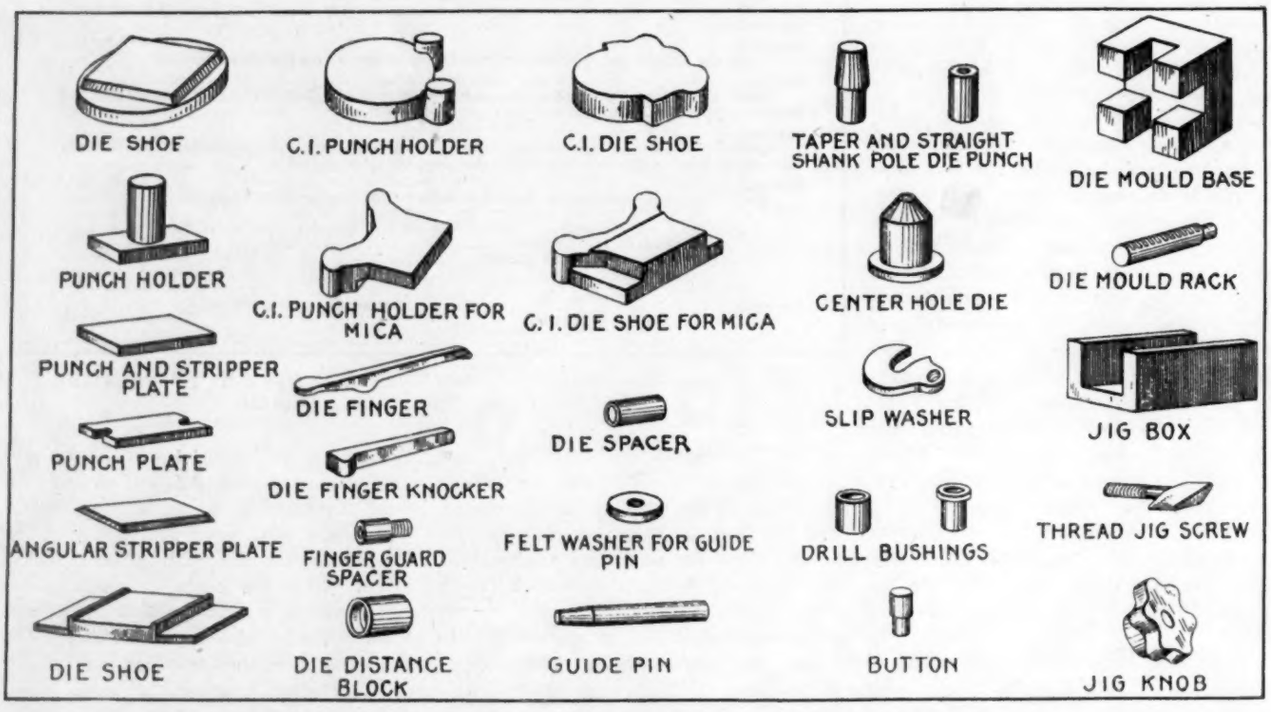


FIG. 5—SIMILARITY OF PARTS SHOWING FEASIBILITY OF STANDARDIZATION

dimensions in brackets: thus 4¼″ $\left\{\begin{matrix}4.251''\\4.248''\end{matrix}\right\}$. There has, however, been a certain preference expressed for a slightly different method, namely 4¼″ $\left\{\begin{matrix}''+0.001\\''-0.002\end{matrix}\right\}$, but the objection to this method is that whoever uses these dimensions must add or subtract the allowance each time they are used. At present it is the custom to specify drawing dimensions in feet and inches, but the advisability of changing to inches only has been under discussion for some time. Among the arguments in favor of such a change are: Increased accuracy in actual manufacturing, since there would be no translating from feet to inches; the dimensioning of drawings would be simplified, especially if the designating mark (″) were omitted; it is already the custom to specify inches for some kinds of sheet material, as for example 24″ by 96″; storeroom accounts for certain items would be rather more easily reckoned; and there would be less danger in making mistakes when ordering many items, especially where the quantities were small. However, the fact that no decision has yet been reached shows there are adverse arguments to be considered as well.

The monthly consumption of various expense materials, such as oils, greases, waste, incandescent lamps, janitor's supplies, etc., has been estimated for the individual manufacturing departments, based on normal production. From these investigations, allowances have been set on each item and a department is permitted to draw from the storerooms on requisitions up to its allowance. Anything in excess must first receive the approval of the superintendent of the department. Of course, when production rises or falls abnormally, the allowances are changed accordingly. The main idea in a scheme of this kind is to aid the superintendent of the department in keeping down expense items by calling his attention to such as are overrun, thus affording him an opportunity to investigate the matter either at or close to the time of its occurrence, rather than at a remoter period when the details are no longer remembered by those concerned.

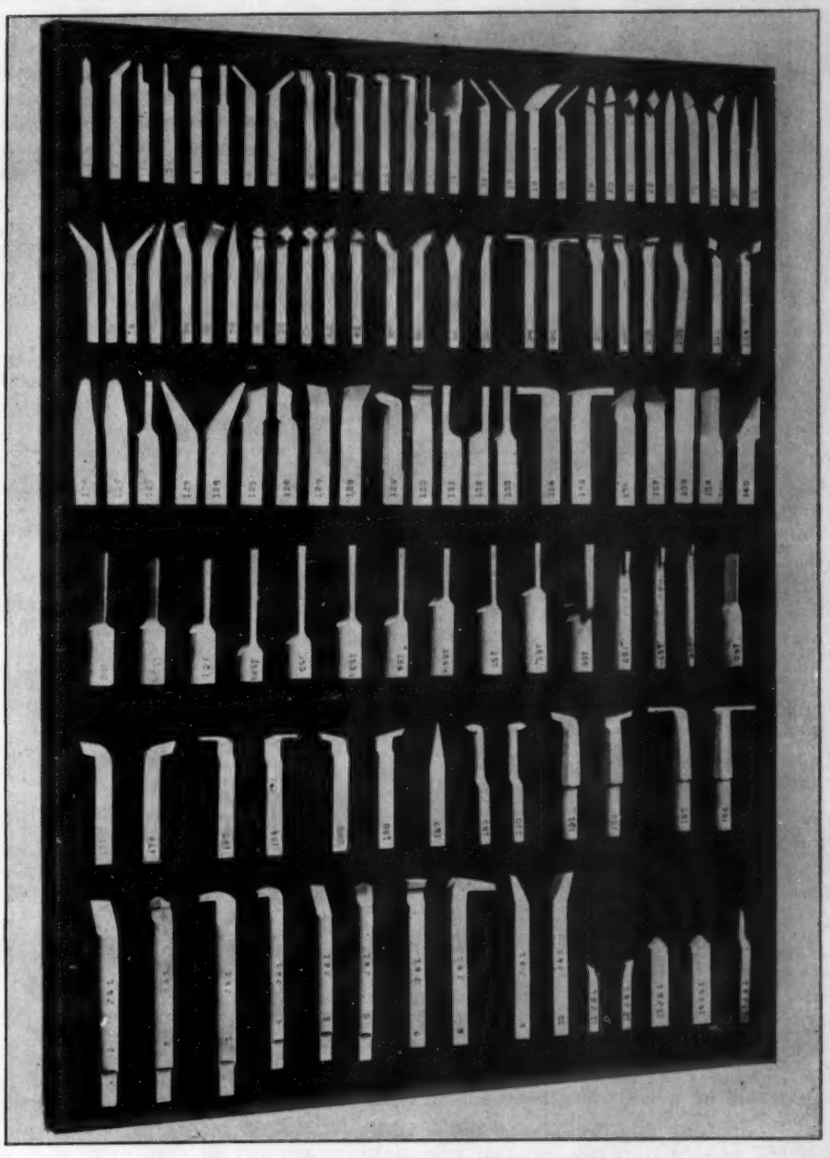


FIG. 6—STANDARDIZED CUTTING TOOLS

Considerable attention is being given to the economical handling of the smaller materials; and while the problem is one whose complete solution is still far removed, nevertheless certain gains have been made over previously existing methods, a few of which may be worth enumerating. Much of the very small material is packed preparatory to transportation, in suitable cloth bags which can be purchased at very low figures and used many times. These have the advantage over wrapping paper or paper bags in that they do not tear readily when the material is oily, as is usually the case. Larger material is placed directly in tote boxes, either with or without wheels; and, while originally of wood, these are now being made of metal, those without wheels being telescopic for economical stacking. For transporting, besides the standard gage steam and narrow gage electric storage battery cars, the three forms of trucks are found to be useful, hand, platform-lifting and electric storage. Before installing the electric storage trucks, careful tests were made to determine the possible saving over sand trucks, the result being that a single electric storage truck with a crew of two men was found equivalent to two hand trucks with a total of four to five men. Expressed in a somewhat different manner, the electric storage trucks returned a handsome profit by the end of the second year. One of the marked indirect gains made by the use of these trucks was in the receiving or unloading department, where the ability to remove material almost as fast as unloaded from incoming freight cars, eliminated from consideration the necessity of providing additional floor space for a department which formerly having only hand truck facilities had become congested.

A very complete central storage warehouse for oils has recently been erected. From it radiate to the various manufacturing buildings supply pipes, several of which are approximately one-quarter mile in length. By means of a system of remote electrical control, an operator, standing at the delivery end of one of these pipes, can start an electrically driven pump in the central storage warehouse and cause to flow a supply of oil of any amount desired. The operator being stationed at his post during certain hours of each day, it is an easy matter for any manufacturing department to send to him for whatever may be required, thus making a short haul out of what would otherwise be a long one. A further improvement will be made in this scheme, however, by having one or more electric storage trucks fitted with oil tanks which will be filled from time to time at these supply stations. These trucks will then cover certain routes, delivering oils to the various manufacturing departments direct. It is at once obvious that a still further amplification of the scheme will be the delivering of material from storerooms to departments and between departments.

For the handling of shop mail, a central post office has been established with pneumatic tubes running to sub-stations in all of the principal departments. From these points, girls in turn carry the mail matter to the individual foremen's desks. While it would be overstating the case to say that work along the lines of safety has been standardized, nevertheless, certain well-defined steps have been taken with the object of a systematic handling of it. In commencing this work originally and on a routine basis, it was properly assumed that certain precautions or safeguards had been omitted. All tools or equipment were therefore, arbitrarily divided into three classes: (1) those which were dangerous in the extreme; (2) those in which there was liability of injury though slight in character; (3) those in which the liability of injury was so very remote as to be negligible. A supervisor of safety appliances was appointed to take direct charge of this work and a monthly appropriation issued to cover the cost involved. Further, a ruling was made that no new tools should be erected nor any old tools replaced without adequate safeguards being provided; and, purchasing specifications for new tools were made to state that preference would be accorded to properly guarded tools. With such arrangements effectively in force, it is obvious that dangerous tools or equipment must gradually be eliminated; and, to such an extent has this now been carried that an analysis of the accidents for the past year shows but three-tenths of one per cent to have been caused by the absence of safeguards. In this connection, it is of importance to note that this same analysis also shows that by far the largest percentage, namely, 21½ per cent, were due to the carelessness of the injured themselves, showing that a campaign of education must be undertaken. This is being accomplished in several ways, as, for example, through the medium of small yet prominent Safety First metal plates which have been placed in a prominent position on every machine, usually the ram, in the punch shop. Signs bearing this and similar legends have been recently standardized by several national societies, among them founders, manufacturers, metal trades, and electric light, and these have been adopted also for use at suitable locations throughout the works. First-aid kits and a method of resuscitation have also been adopted and lectures on the application of both are given to such employes as are at all likely to be called upon to make use of this knowledge, each one being put through the actual movements involved. These lectures are repeated to the same individuals at intervals of six months, so that the subject will not be forgotten.

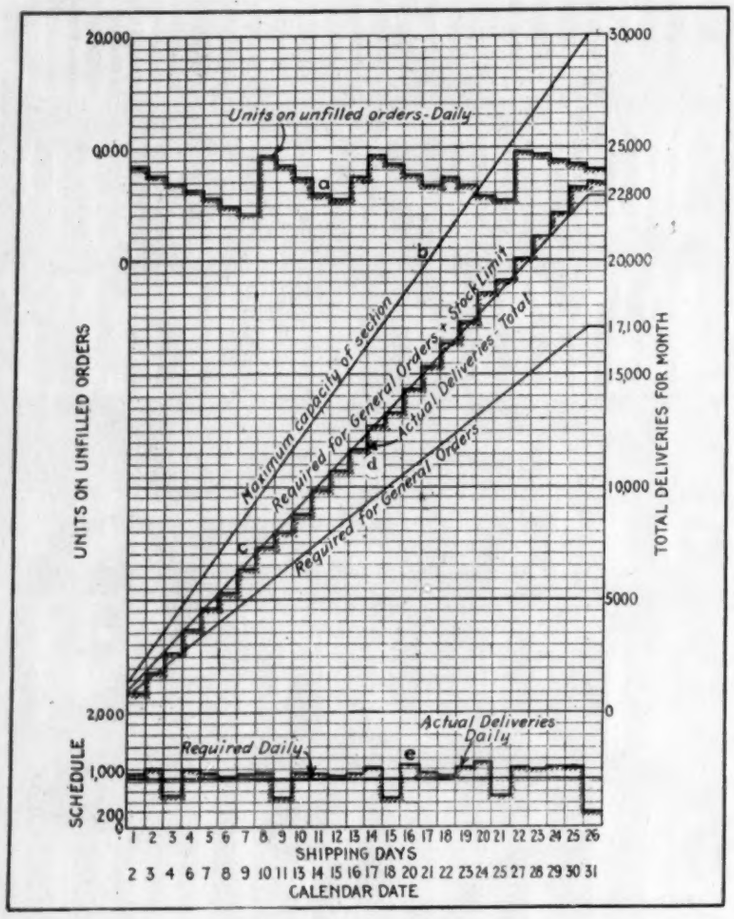


FIG. 7—LOAD DIAGRAM

All stock ledgers are regularly scrutinized by the storekeeping department and such items as are considered slow-moving or inactive submitted to a materials disposition department that investigates not only the cause of the inactivity with a view to preventing a recurrence but at the same time endeavors to dispose of the material to the best advantage. Quarterly "clean-up' inventories have also been instituted throughout the works, at which times all partially completed materials which have become inactive due either to cancellation, hold, reduction or change in design of orders, are investigated by this same department with a view to their quickest and most advantageous disposal.

It has been truly said with respect to the electrical and mechanical industries that the only thing constant was change. It is well to bear this fact in mind when carrying on the work of standardization. Shop standards, regardless of their name, should be considered as relative, not absolute, and should therefore admit of a certain degree of flexibility, being capable of revision from time to time and should apply to new work only.

The History of a Bad Furnace Cast

Details Regarding an Off-Cast of Iron High in Sulphur Caused Primarily by Cold Air in the Furnace

BY WALLACE G. IMHOFF

THE particular value that lies in interpreting the causes of an "off-cast" of the blast furnace does not come from the knowledge acquired in regard to that particular cast, but in the fact that this knowledge may be used to advantage at some time when the furnace is going off permanently. There are very few furnaces that do not have "off-casts," and the number that have gone off permanently at some time or other is exceedingly large. The very reason that it is not known beforehand whether it will be only an off-cast or whether it is a more serious trouble warrants a thorough investigation into the causes of individual off-casts.

Typical Example of Off-Cast

We give below a typical example of such a cast, clearly the result of only temporary conditions, together with the reasons for its variation from the usual run; also an effort is made to interpret the causes of the variation. In this case the furnace was running in perfect condition, as shown by the iron and cinder analyses of the three casts just previous to the bad one. These analyses are:

	Cast No. 1.	Cast No. 2.	Cast No. 3.
Silicon	3.65	3.10	3.02
Sulphur	0.013	0.030	0.027
Phosphorus	....	0.59	....
Manganese	....	0.73	....
Silica (SiO)	....	33.48	....
Alumina (Al_2O_3)	....	14.40	....
Calcium oxide (CaO).	....	47.12	....

From the foregoing analyses it will be seen that the furnace was received in good condition by the day shift. About two hours after the 6 o'clock cast the first flush was made. In the meantime evidence of too much lime was beginning to appear, the first of which was that the furnace would not take stock. Every time it was to be filled, 30-minute intervals being allowed for filling, the stock had to be forced down by a check or slack, and the slip was only a foot or so. This continued until it became a dangerous proposition to slip it because of the accumulated cinder.

The first flush was made at 8 o'clock, with the furnace sticking up for 35 minutes. The furnace was very hot and the characteristics of the hot cinder and the cold sample may be summarized in the following tabulation, which gives its appearance at a glance:

1.—Very hot.
2.—Lots of heavy white fume.
3.—Ran slow in the runner.
4.—Dry mucky cinder.
5.—Basic characteristics. (sample)
6.—Extremely dark grey to slate color. (sample)
7.—Full of gas cavities, light, porous. (sample)
8.—High rounded top on sample.
9.—White top on sample.
10.—Extreme boiling out due to gas in cinder.
11.—Dropped short from sample dipper.
12.—No evidence of sulphur on a sample-top when poured hot.
13.—Left a very large runner.
14.—Large gas flames emitted while running.
15.—Spit fine white balls.
16.—Sample showed very high lime.
17.—Sample was porous like a sponge.
18.—The sample dipper was white.
19.—The flush showed the furnace to be hotter than the previous cast.
20.—No evidence of sulphur on cold sample.
21.—No silica flakes.
22.—No buck shot.
23.—No smell to fumes.
24.—No evidence of silica on outside edges of sample.

This first flush showed the furnace in excellent condition to make good iron, except for the fact that it was a little limy. Some of the other general features as to the condition of the furnace will be enumerated. The burden was as follows: Coke, 2,840 pounds; ore, 3,800 pounds; stone, 1,700 pounds; air, 13,000 cubic feet per minute; steam, 115 pounds per square inch; blast pressure, average, 9 pounds; top heat, 650 degrees Fahr.; gas, very white, heavy and lots of it; stove heat put on at 1,600 degrees and taken off at 1,400 degrees.

After flushing, the furnace was given a check to slip it in order to continue filling. At the same time cold air was put into the furnace by the by-pass. Driving went extremely slow and the furnace was soon filled again. After three-quarters of an hour of cold air the furnace made a bad slip on a stove change and filled a couple of the pipes with coke.

At 8:30 the second flush was knocked out. The characteristics of this cinder while run and in the cold sample are given in the following tabulation:

1.—Very hot.
2.—Lots of smoke.
3.—Ran slow in runner.
4.—Dry, mucky, spit less than first flush.
5.—Basic characteristics. (Sample)
6.—Lighter grey than the first.
7.—A few gas cavities.
8.—Almost level top.
9.—Black on top.
10.—Only a little boiling out.
11.—Dropped short.
12.—No signs of sulphur in hot pouring of sample.
13.—Large runner left.
14.—Large gas flames.
15.—Spit less than first flush.
16.—Limy, earthy.
17.—Almost solid sample.
18.—Black dipper.
19.—Colder than first flush.
20.—No evidence of sulphur on cold sample.
21.—Lots of silica flakes.
22.—Some buck shot
23.—Sulphur fumes, cutting on throat.
24.—Evidence of silica on outside edges of sample.

Thus the effects of the cold air and slip are already showing their results. The second flush is colder and shows evidence of the beginning of transfer of silicon to silica in the slag; the cinder is a little more fluid and runs better; the evidence of the rise in sulphur in the iron is beginning to show up; the cinder has a glassy or watery appearance and many other conditions are noted which show the beginning of a change. The sample shows a distinct yellow color uniformly throughout the center.

Characteristics of Third Flush

Still the furnace continues to drive very slowly and it is again given a check after the second flush to make it take stock. Again the slip is but slight and the furnace is away behind the usual number of charges.

At 9:15 the third flush is made just before cast, casts being made every four hours, 10 a. m., 2 p. m., 6 p. m., etc. The characteristics of this flush while running and in the cold sample are as follows:

1.—Very hot.
2.—Lots of smoke.
3.—Runs easily in the runner.
4.—Thin.
5.—Basic characteristics (sample).
6.—Color not given.
7.—Solid, no cavities.
8.—Level on top.
9.—White spotted top.
10.—Practically no boiling over.
11.—Dropped short.
12.—Good evidence of sulphur when poured hot.
13.—Medium sized runner.
14.—Smaller gas flames.
15.—No spitting.
16.—Limy, earthy.
17.—Solid.
18.—White dipper.
19.—Colder than second.
20.—Evidence of sulphur on cold sample.
21.—No silica flakes.
22.—More buckshot than second.
23.—Sulphur fumes unbreathable.
24.—More evidence of silica on outside edges of sample.

Comparing the third and first flushes it will be observed that very important changes have taken place in the cinder, both in appearance when run hot and in the samples when cold. The third is more yellow in the center than the second; there are no silica flakes, the slag is more fluid, and there is evidence on every hand that the sulphur has gone up in the iron itself.

What will the iron be like? All three flushes have been made and the cold samples are in the box. This can better be prophesied after a discussion of the chemistry of what has taken place.

Chemistry of All Three Flushes

Since the furnace was very hot and very limy on the first flush two prominent features stand out immediately, the silicon will be in the iron, the sulphur will be in the cinder. We see only the one side all of the time, that is, we see the slag but get the iron too late to do anything after the cast has been made; in other words, the iron must be made from the appearance of the slag.

Silica gives more fluidity to the cinder and therefore since the first flush was very dry and spit, the most of the silicon must have been reduced and gone into the iron. The lime present combines with the sulphur in the form of calcium sulphide which has no properties of fluidity in itself, hence the dry, spitting cinder. Only a very small portion of the silicon has gone into the slag as silica to form calcium silicate. Hence from this flush a high silicon low sulphur iron should be expected as shown by the three previous casts.

Then the cold air and the slip take effect after the first cast flush. The furnace is colder, as shown by the black coat on the cinder; the decrease in the temperature has had the tendency to throw the silicon into the slag, but the slag being colder and an enormous excess of sulphur being present, the lime has not been able to combine with the silica, and after the sample has cooled it is found that this silica has crystallized out as free silica flakes glittering all over the dipper and the top of the slag sample. This free silica has also given the hot running cinder the glassy or watery appearance. The excess sulphur which has not been taken care of by the lime has been given off as the choking gas, and has been separated out as yellow sulphur in the center of the sample. From this flush a slight decrease in the silicon from the iron and increase in silica in the slag is expected; also a marked increase in sulphur in the iron, since if it is not taken out by the slag it will go into the iron.

Indicate Coming Change

Further developments in the third flush give evidence of the radical change which is about to take place in the iron. The white fumes have decreased in volume and are replaced by a suffocating sulphur odor; there is no spitting and the slag runs fluidly to the cinder pit; the large flames have decreased in size and the sample, when poured, shows all the evidence of high sulphur in the iron. The furnace is colder, more silicon has been driven into the slag as silica; the lime has a stronger affinity for the silica at the given temperature than it has for the sulphur, hence the increased formation of calcium silicate at the expense of the decreasing calcium sulphide, permitting the still greater excess of sulphur to go into the iron, to escape into the air as suffocating fumes, and to settle in the samples as yellow sulphur. The silica flakes have disappeared, since the conditions are now just right to combine the silica with the lime.

In other words, there seems to be a certain temperature above which the lime has a stronger attraction for the sulphur than the silica, and any excess silica must crystallize out as free silica flakes; below this temperature the lime has a greater affinity for the silica and the sulphur must go into the iron and escape into the air; a small portion forms calcium sulphide and a small portion shows up as the free yellow sulphur.

Characteristics of the Iron

The chemistry of the cinders being known, a better idea of what to expect in the iron is at hand. In the cast made the iron showed the following characteristics when run and when in the form of a cold sample:

1.—The sample top is level.
2.—The iron is thin.
3.—It solidifies slowly.
4.—It leaves very large troughs of scrap.
5.—It shows cracks and breaks when closing up.
6.—It shows small eyes or pin dots.
7.—The grain is fine.
8.—There is no shrinkage or hump in the sample.
9.—It is coated with pimples or spots, which coating when broken off shows small pits and a silvery coating.
10.—The iron is clean, picking up no dirt as it runs.
11.—It does not have a black coating on top.
12.—It is watery looking on top.
13.—There are no sulphur sparks.
14.—The top is coated with small grease spots.
15.—No iron sticks to the dipper.
16.—There are no sparks in the runner.
17.—There is no buck shot.
18.—The sample does not quiver.
19.—The sample is dark across the fracture.
20.—There is an extremely large amount of graphitic carbon present in the form of graphite floating through the cast house.
21.—The iron bears a watery look like mercury or quicksilver.
22.—The iron is very smooth on top and clean when in the beds.

From the above it is seen that the iron is high silicon, high sulphur iron and a complete change or off-cast from the preceding iron, which has all been very good.

The analyses demonstrate that the sulphur has gone up very much. The complete analyses of the iron and cinder of the three casts before and the three casts following are given to show that this is a typical off-cast of iron. It corresponds to No. 4.

Cast No.	Silicon	Sulphur	Phosphorus	Manganese	Silica (Si O)	Alumina (Al O)	Calcium Oxide (Ca O)
1	3.65	0.013	....	....	.....	.....	.....
2	3.10	0.030	0.59	0.73	33.48	14.40	47.12
3	3.02	0.027	....	....	.....	.....	.....
*	3.26	0.095	....	....	.....	.....	.....
5	3.12	0.020	....	....	.....	.....	.....
6	2.80	0.013	0.55	0.90	32.20	13.64	49.16
7	2.52	0.015	....	....	.....	.....	.....

*Off cast.

The cycle of events explaining the off-cast are, a limy furnace; cold air to thin the cinder and make the furnace drive, and a bad slip, due to cold air, projecting cold stock into the hearth. The first flush shows silicon going to the iron and the lime taking care of the sulphur. The second flush shows decrease of temperature and some silicon free to enter the slag. Instead of doing so, it crystallizes out as free silica flakes; excess of sulphur is present, as now part of the lime has been taken to form calcium silicate, leaving the excess sulphur free to go into the iron, escape as a gas, and settle out as yellow sulphur in the slag sample. The third flush shows a large amount of silicon in the cinder, giving it fluidity and using up the lime from the sulphur. The result is a very large excess of sulphur in the iron, escaping as a gas, and showing in the sample as yellow sulphur. There are no silica flakes, for the reason that the temperature of the furnace is such that the lime has a stronger affinity for the silica than it has for the sulphur. The analyses of the three previous casts of iron and cinder substantiate the fact that this is clearly an off-cast primarily traced to cold air.

The General Electric Co., Schenectady, N. Y., has recently issued a bulletin giving a detailed description of the company's direct current commutating pole motors. These motors are built with a frame of cast steel of medium weight with symmetrical section. The motors can be used with a sliding base which maintains a correct driving alignment, and which, with the adjustable shields, permits the installation of the motor on either the floor, wall or ceiling. These motors may be equipped with covers, rendering them semi-enclosed, totally enclosed or self-ventilated. They are wound for 115, 230 and 550 volts direct current circuits, with permissible voltage range of from 110 to 125, 220 to 250 and 500 to 600 volts. Illustrations of the various parts of the motors, together with dimension diagrams are included in the bulletin.

Scientific Operation of a Cupola

A Discussion of the Importance of Measuring All Materials Going Into the Cupola, Including the Pressure and Volume of Air

BY DAVID TOWNSEND

EVEN today there are foundries run by men who brag that any old boiler shell can be set on end, bricked up and made into a good working cupola. Such foundrymen, when asked for their melting records, will give figures which are purely imaginative and nowhere near correct when determined from their actual practice. Foundries are running behind today because of their high percentage of bad castings and melting losses due to causes which could be definitely determined and corrected if the same amount of time, trouble and brains were put into the job as would be considered a fair expenditure for investigating and improving any other foundry operation.

No concerted action has as yet been taken by the various manufacturers of cupolas to standardize the variables which form the basis for a properly constructed machine, such as number, position and size of tuyeres, location and size of wind box, diameter of wind pipe as affected by distance between cupola and blower, shape of interior outline of the lining and many other minor points, which might be scientifically determined so they could be forever removed from the field of speculation or of personal opinion.

It is true that a start was made in this direction by the government in its testing laboratory at St. Louis, the results of which will be found in Bulletin No. 54 of the bureau of mines; but the investigation covered only a limited field, being based on the results obtained from a size of cupola, 27-inch, which is not generally used except by small jobbing shops or for occasional small or special heats in the larger plants.

If you will stop to consider the high standing and scientific reputation of the long line of investigators of the blast furnace you can appreciate possibilities of the foundry cupola which is but the child of the larger furnace and except in the degree of heat obtained, is just as susceptible to a proper treatment as was its larger parent. Millions have been spent by the builders and owners of blast furnaces in accurately determining every variable factor entering into the production of pig iron and auxiliary apparatus of the most expensive character has been added in order to obtain a high temperature of blast and a supply of air for combustion which will be free from moisture.

Although moisture-free air is undoubtedly too much of a refinement for the cupola which is operated only intermittently, it might be possible to use the waste gases to heat the incoming air; it also would pay to accurately determine the best shape for the interior lining and to adopt a standard for charging and operating which would produce fairly uniform results. The average foundryman is too much occupied in trying to make good castings at a low cost to give his time or intelligent investigation to discovering the exact conditions governing the running of his cupola or in making experiments to improve its operation.

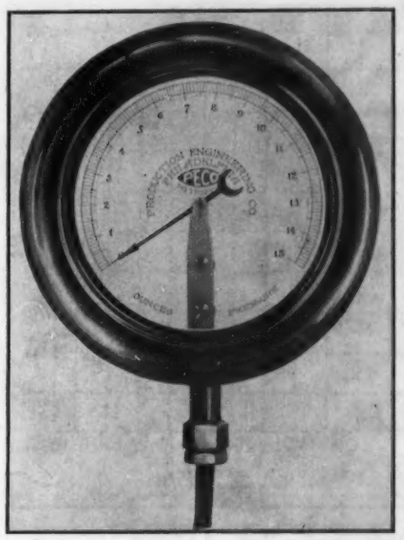


FIG. 1 — INSTRUMENT FOR MEASURING CUPOLA BLAST PRESSURE

Utilizing Waste Gases

In the blast furnace the waste gases are used to heat the blast to from 1,000 to 1,500 degrees Fahr., but in the cupola, all this valuable heat is practically wasted. Of course the waste gases from the cupola will have a very much lower temperature than those from the blast furnace, as the cupola temperature averages 2,800 degrees Fahr. at the melting zone as against 3,500 degrees in the blast furnace.

Numerous attempts have been made in the past to utilize the waste heat but there will have to be a radical departure from the present design of the cupola before it can be accomplished. In other words, the cupola must be converted into a miniature blast furnace with charging bell and means to maintain it under a uniform pressure, no matter how small. This obviously cannot be done on a small size cupola used for a few hours every day, but there should be no insuperable difficulty in accomplishing it in the large tonnage foundry.

Every melting operation requires the application of heat derived from some form of carbon, either gaseous, liquid or solid; the heat is evolved by the combination with the carbon, at a proper temperature, of sufficient oxygen to completely convert it into carbon dioxide for the purpose of obtaining the maximum benefit from the union in the shape of heat. Any apparatus which permits the consumption of fuel under conditions by which a portion of the possible heat may be lost is defective either in construction or in operation, and usually in both.

The importance of securing and maintaining a proper combination of carbon and oxygen is shown by the fact that carbon when burned completely to carbon dioxide gives off about 14,500 B. T. U. while carbon burned to carbon monoxide produces only 4,450 B. T. U., representing a direct loss of about 10,000 B. T. U. by imperfect combustion, and as both carbon monoxide and carbon dioxide are colorless, odorless gases, the loss may be taking place and be continuous without the knowledge of the operator, in fact nothing but an analysis of the gases will definitely fix the responsibility. In these days of automatic carbon dioxide recorders of low price there is no reason except habit which would prevent a study of the gases being produced by any series of conditions, which can then be controlled until a uniform method of operation has been evolved and has been reduced to a set of fixed rules. Every pound of pure carbon theo-

A paper read before the Philadelphia Foundrymen's Association. The author, David Townsend, is president of the Production Engineering Co., Philadelphia.

retically requires 2.67 pounds of oxygen or 11.52 pounds of air for its complete combustion. Unfortunately air contains only about 23 per cent of oxygen, the balance being largely nitrogen which is an inert gas, supplied by nature to prevent a too rapid combustion.

An average 72-hour Pennsylvania foundry coke has about the following analysis:

	Per Cent.
Moisture	0.50
Volatile Combustible	0.60
Fixed Carbon	87.75
Ash	10.35
Sulphur	0.80
	100.00

In order to burn this coke completely we must supply sufficient air to furnish the necessary amount of oxygen. That is to say, if we assume for the sake of illustration only that the cupola is running on a 10 to 1 fuel ratio; for each 2,000 pounds of iron we will use 200 pounds of coke of which 175.5 pounds will be carbon requiring 2,022 pounds of air for its complete combustion. Air is usually measured in cubic feet, but as the weight varies with the temperature, moisture, etc., we may assume that it will be supplied at an average temperature of 70 degrees Fahr. in which case the coke will require 154.7 cubic feet of free air per pound of carbon or a total of 27,150 cubic feet, which is not far from the 30,000 cubic feet of free air usually considered necessary to melt one ton of iron.

An admirable discussion of the variables entering into the melting of iron in a cupola may be found in Bulletin No. 3 issued by the bureau of mines, but particular attention should be called to the fact that even if the proper combination of air and fuel may have taken place in the melting zone, actual heat might be lost if conditions are such that the carbon dioxide is reacted on in passing up through the incandescent coke and reduced to carbon monoxide; the latter gas may be detected by the flame burning in the upper part of the cupola. This reaction takes up the heat which it had previously given off, and the result is a very considerable drop in temperature, thus robbing the descending iron of the amount of pre-heating it would otherwise get before sinking into the melting zone.

Importance of Proper Air Distribution

The proper distribution of the air entering the cupola and its union with the fuel will explain and cure many ills such as burnt, cold and spongy iron, which are the result, not so much of the quality of the metal charged, as of errors in melting and manipulation, which may be classified and corrected. Considerable care generally is taken to measure and record the amount of iron and coke which are put into the cupola, but few foundrymen weigh or measure the air that is being used. That this is just as important an item as any other cannot be disputed when it is remembered that of the 27,150 cubic feet of air mentioned previously about 77 per cent is nitrogen, which must be heated to the temperature of the furnace and then discharged into the atmosphere without having done any work, unless it is utilized to preheat the incoming air, as is done in the blast furnace.

In furnishing air to the cupola, the most important condition is to have a continuous supply at a constant pressure and this can be obtained by having an air tight chamber of sufficient size between the cupola and the source of air supply to equalize all pulsations, belt slippage, etc., which will otherwise affect conditions for proper working. The present wind box supplied by the cupola builder does not usually give a sufficient volume to properly equalize the pressure.

It is not only important to get the right amount of air for complete combustion into the cupola, but equally so, not to get too much, as a surplus of various amounts has a decided cooling effect. This is indicated by Fig. 2.

The amount of air necessary for the complete combustion of the fuel put into a cupola depends upon a number of variables, of which the carbon content of the fuel, pressure and distribution of the air, and constancy of supply of both fuel and air are the principal items.

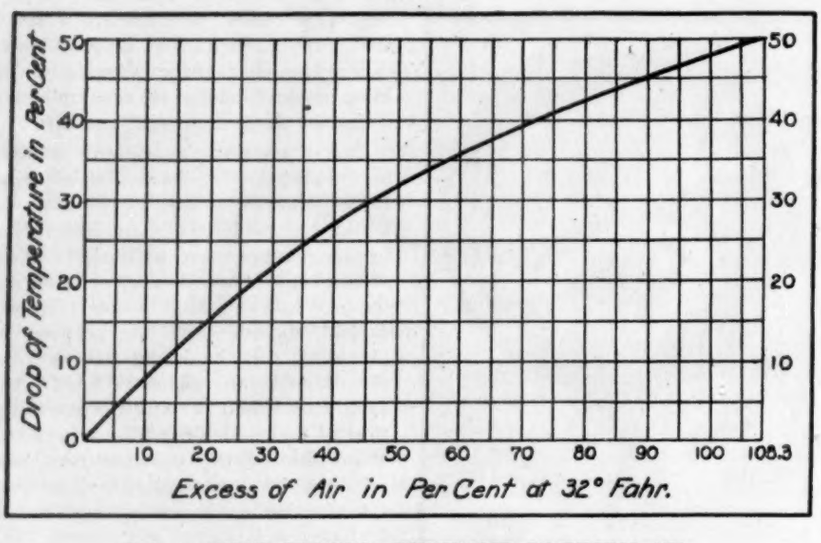


FIG. 2—CURVE SHOWING INFLUENCE OF EXCESS AIR ON FURNACE TEMPERATURE

Pressure Gages

Most of the present instruments for measuring small blast pressures are too limited in range for quick observation by the melter or foreman and, with one or two exceptions, those for determining the volume of air are too complicated to be of any value for every-day work, being designed for use by a specially trained assistant or engineer. The direct mercury pressure gages having a range up to 16 ounces, have a total movement of only about 2 inches or ⅛-inch reading to an ounce of pressure, and while the water U-tube has a length of 27¾ inches for the same range of pressure, it takes up considerable space and is liable to be broken; in addition to which a scale must be furnished for reading differences in heights between the two legs.

The company with which the writer is associated has designed and patented a low pressure circular gage ranging from 0 to 16 ounces pressure, the readings being indicated on a circular dial, similar to all steam gages and having divisions as fine as 1/10-ounce which are easily readable, the division for one ounce being ⅞-inch in length. The same gage when filled with a special liquid will read from 0 to 2 inches of water for either pressure or vacuum, the divisions being as fine as 1/500-inch of water. This gage, shown in Fig. 1, has almost the appearance of a steam gage of similar size. It is 7 inches in diameter x 3¾ inches deep. It is constructed on the float principle, but has been so made that the liquid can be shipped in the gage without any danger of spilling, being entirely self-contained. It has several other features, the most

important being means for bringing the hand to the zero point on the scale whenever necessary, and a three way plug cock which prevents any excessive pressure from being suddenly thrown into the gage which might break the glass or spill some of the liquid. Provision has been made to limit the capacity of the gage to the length of the scale, as any additional pressure automatically closes the opening into the liquid chamber. A means has also been devised by which it is believed the scale readings are made accurate throughout the whole scale length.

Measuring the Volume of Air

It is much more difficult, however, to determine the volume of air going into the cupola at any given time. This is usually done by means of a Pitot tube, which consists of two copper tubes of small diameter, having their ends bent over at right angles and tapered, the two tubes being fastened together so that the bent ends point in opposite directions. The free ends of the tubes are attached to the draft or pressure gages in such a manner that the readings will represent the pressure in one tube and the suction in the other, the difference being a measure of the velocity of the air in the blast pipe and from which the volume of air passing may be determined. The position of the two bent tubes in the blast pipe gives different readings and an average must be obtained to get scientific results.

On account of pressures produced in the two Pitot tubes being very small, it is usually necessary to use two inclined manometers reading in inches of water and use the differences for making the velocity calculations. This introduces an element of uncertainty on account of there being two instruments to calibrate and read simultaneously. A differential blast meter, however, has been devised by Charles J. Clark, Chicago, which is said to be satisfactory.

The low pressure and vacuum gage reading to one or two inches of water and down to 1/1000-inch if required as built by the Production Engineering Co., gives this difference of pressures between the two Pitot tubes directly on the scale and requires only a simple calculation to determine the volume of air passing through any given size of blast pipe, there being only one instrument and one reading to be made.

A desirable form of volume meter would be one which would be entirely within the blast pipe itself, and through which all the air passing from the blower or fan to cupola must go, there being no average to compute and no loss due to leakage or friction. The Production Engineering Co. has designed and has now in the patent office a meter which is expected to fulfill all the requirements and has in addition a scale from which the volume of air passing at any given time may be read off directly and without calculation.

For the good results a still further piece of apparatus should be provided, namely, a relief valve which can be set to maintain any pressure desired and which will open automatically if an excessive pressure is generated.

The usual practice with cupola tenders when they want to slack down is to reduce the speed of the blower or in some instances shut it down altogether. This of course applies more particularly to positive pressure blowers, as fans will take care of themselves if the blast pipe is closed off. Blowers, however, should not be stopped after being started, but should be relieved and the melting rate regulated by means of a relief valve on the blast pipe line and close to the cupola wind box.

A special air regulating blast valve has been designed and patented for this purpose, which, it is said, can be applied to any size blast pipe and will operate in any position, being adjustable to any pressure and having an automatic relief device for the protection of the blower and the blast pipe. This valve can be set to open at any pressure desired or can be left open, instead of shutting off the blower or fan if for any reason it is desired to stop or slacken the rate of melting. By its use in connection with the pressure gage any desired pressure may be obtained and maintained to produce the rate of melting desired or consistent with that generally considered good practice. Any scientific investigation which embraces only one end of the melting operation would be incomplete. In order to know whether we have succeeded in obtaining the best results possible by a control of the pressure and amount of the blast and its proper distribution in the cupola, we must also know if it has completely performed its intended function during the melting operation. This can be ascertained by an analysis of the waste gases in the stack above the charging door, taken in conjunction with pyrometric temperature readings at several points in the cupola and stack.

In order to secure a proper gas sample from the stack, the sampling tube should go all the way across the inside of the lining and be furnished with a number of equidistant holes to assure a proper average. Care also should be taken to temporarily shut off any air which may be induced through the charging door, by closing it tightly with a temporary solid shield and allowing the gases to flow through the tube for a short time before collecting the sample. A determination of the carbon dioxide, carbon monoxide and oxygen will indicate what is taking place in the melting and heating zones and when taken in conjunction with temperature readings, the necessary remedies may be applied to correct improper methods of operation.

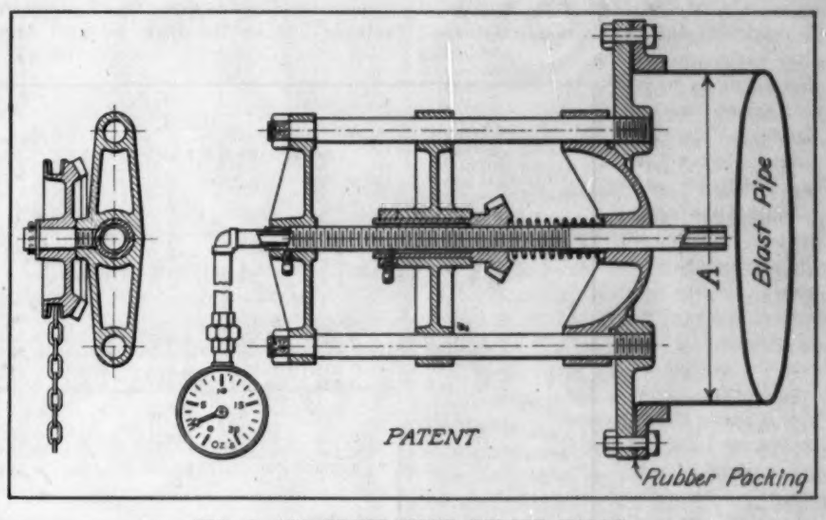


FIG. 3—AIR REGULATING RELIEF VALVE

M. K. Powers Advertising Co., specialist in technical advertising, announces its incorporation under the new name of the Powers-House Co. The personnel and policy of the organization is unchanged and the offices remain, as before, at 724-725 Illuminating building, Cleveland.

Effect of Oxygen on Steel Quality

Data Covering Interesting Experiments Made in England to Determine How Oxygen Affects Open Hearth Steel

BY J. ALLEN PICKARD AND F. M. POTTER

THE following work was undertaken as part of a systematic examination of the oxygen content of commercial steels with a view to collecting trustworthy evidence as to the amount of oxygen normally to be expected in good class material, and the limits within which it is desirable to restrict this element.

The method of estimation which consists in heating the steel in a confined volume of hydrogen with a weighed boat containing phosphorus pentoxide and measuring the increase in weight of the boat, has been used throughout and has fully confirmed the early opinion arrived at as to its convenience and reliability. The importance of adhering strictly to certain details of procedure, chiefly in the precautions necessary in the insertion and removal of the weighed boat of phosphoric oxide, has, however, been clearly shown, and for the convenience of others using the method it will be well to state these precautions here. Care must be taken that the boat is removed from the weighing tube and inserted in the mouth of the combustion tube as quickly as possible and the cap placed in position at once, contamination by moisture from the breath being, of course, carefully avoided. It is also necessary to have the boat ready close to the combustion tube before removing it from its containing vessel, so that the distance of transport through the free air is as short as possible. The total time occupied in inserting and removing it should not exceed 6 seconds, and may be less. Under these circumstances an increase in weight of a blank ranging from 0.0010 to 0.0013-gram is obtained, but defects in manipulation may cause the blank to run as high as 0.0035-gram, which is too large a proportion of the total increase in weight obtained to allow of a proper feeling of certainty of the final result. In weighing the boat, the usual precautions in polishing the weighing tube must be observed and the sensitiveness of the balance must be adjusted to weigh with exactness to 0.1-milligram. If drillings are clean and bright no error in the estimation will be introduced by surface oxidation or condensation of air. An amount of oxygen equal to 0.020 per cent would represent 0.090 per cent of ferrous oxide, or 0.022 gram on a 25-gram sample. If in the form of rust containing hygroscopic moisture and carbon dioxide the weight might easily be 0.035-gram, which would produce a sheet 0.1-millimeter thick and 1 square centimeter in area, and would easily be detected by inspection. The condensation of air on the surface has been shown to have no influence.

Table I.

ACID OPEN-HEARTH STEEL

Sample.	Carbon, per cent.	Manganese, per cent.	Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Oxygen, per cent. i.	Oxygen, per cent. ii.	
1	0.67	0.73	0.95	0.035	0.027	0.004	0.004	Mean—
2	0.79	0.65	0.210	0.030	0.050	0.020	0.021	Carbon, 0.87
3	0.93	0.68	0.035	0.031	0.027	0.007	0.006	Oxygen, 0.011
4	1.08	0.62	0.024	0.033	0.022	0.012	0.016	
								Mean—
5	1.18	0.65	0.056	0.027	0.025	0.005	0.006	Carbon, 1.35
6	1.33	0.42	0.140	0.030	0.024	0.004	0.007	Oxygen, 0.007
7	1.55	0.49	0.100	0.027	0.026	0.010	0.012	Mean of all— Oxygen, 0.0096

The determinations were in most cases carried out in duplicate by the two authors independently. The weights of steel used in each estimation were from 20 to 30 grams or more, and the furnace was heated to a temperature estimated at 1,000 degrees Cent. No increase in the percentages found was observed on employing higher temperatures or longer times of heating, 30 minutes being quite sufficient. The blank remained unchanged when longer periods of heating were given: indeed the blank obtained if the heating be omitted altogether is practically identical with that when the whole experiment is carried through in the ordinary way. This fact is important as showing that the walls of the tube are totally impervious, and that no oxygen from the air leaks through during the course of the experiment.

The majority of samples examined in this work were supplied to the authors by S. Fox & Co., Ltd., Sheffield, and the Cargo Fleet Iron & Steel Co., Ltd., Middlesborough, England. All the steels were made by either the acid or the basic open-hearth process, and, as far as can be judged from their analyses, they were generally of excellent quality. In the accompanying tables the samples are arranged in order of carbon content. The actual figures obtained for oxygen in duplicate analyses are given in the last two columns of each table; they show the amount of agreement ordinarily obtained when using this method. It had been expected that it might be possible to discover some relationship between the oxygen and the carbon content, but the results quoted lend but little support to this theory. Samples 9 and 12, containing 0.14 and 0.26 per cent of carbon respectively, contain only 0.011 and 0.005 per cent of oxygen, while No. 14 with 0.32 per cent of carbon contains 0.041 per cent, and even No. 22 with 0.61 per cent of carbon also contains 0.041 per cent of oxygen. One most important conclusion to be drawn is that it is possible to make all kinds of open-hearth steel, even low-carbon low-silicon basic (No. 9), practically free from oxygen—containing only 0.010 per cent or under. That some steels are made containing more than that amount is, however, abundantly shown by the other results, and it is to be observed that the cheaper steels contain higher oxygen.

Acid open-hearth steel is generally admitted to be of better quality than

Presented at a recent meeting of the Iron and Steel Institute.

basic open-hearth, and it has been suggested that this is due to the higher oxygen content in basic steel. In the foregoing tables all the high-oxygen steels, that is, over 0.020 per cent, except one (No. 2) are found in the basic group, so that the evidence does support the conclusion that basic steel is higher in oxygen. It is to be noted, however, that only two of the basic steels are higher in carbon than the lowest of the acid group, and no marked difference is to be noted in those samples comparable in carbon content; indeed No. 2, an acid steel, is higher in oxygen than Nos. 23, 25 and 26, which are basic.

An interesting question is raised by the fact that the samples that must have received most hot-working are all high in oxygen. Nos. 14 and 15 were taken from two fishplates, No. 22 from a rail, while the other samples were from fair-sized billets. The possibility that the oxygen content may vary after the steel has solidified has, so far as the authors are aware, not hitherto been considered. It must be borne in mind, however, that these steels, as judged from their other constituents, were not of the very highest quality, and that Nos. 8, 10, 13, 18 and 21, which are all high in oxygen, were of cheap make.

The results obtained by previous workers are very scanty. The authors have only found the figures given by Cubillo, who gave for acid open-hearth steel in the ladle, 0.004 per cent of oxygen; and R. H. McMillen, who has published the following data:

	Samples. Basic open-hearth.		
C, per cent.	0.07	0.08	0.36
Mn, per cent.	0.06	0.22	0.69
Si, per cent.	0.08	0.01	0.03
S, per cent.	0.019	0.016	0.040
P, per cent.	0.008	0.008	0.046
O, per cent, i.	0.113	0.079	0.043
O, per cent, ii.	0.115	0.072	0.042

The method of reduction in a current of hydrogen, used by both workers, is open to several objections. With regard to McMillen's figures it is noticeable that they are very much higher than those found for any steel examined by the authors. Taking this in conjunction with the fact that no steel examined by McMillen gave a lower value than 0.035 per cent—even crucible steels, containing 1.17 per cent and 1.14 per cent of carbon, showing 0.035 per cent and 0.045 per cent respectively of oxygen — the authors are inclined to think that he must have been the victim of a systematic error apparently not recognized.

Table II.

BASIC OPEN-HEARTH STEEL.

Sample.	Carbon, per cent.	Manganese, per cent.	Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Oxygen, per cent. i.	Oxygen, per cent. ii.	
8	0.10	....	.....	.....	.....	0.038	0.036	
9	0.14	0.35	0.020	0.033	0.018	0.010	0.011	
10	0.20	....	.....	.....	.....	0.031	0.028	
11	0.23	0.70	.....	0.060	0.026	0.013	0.014	Mean—
12	0.26	0.49	0.120	0.030	0.031	0.003	0.006	Carbon, 0.25
13	0.30	....	.....	.....	.....	0.030	0.027	Oxygen, 0.021
14	0.32	0.62	.....	0.051	0.020	0.040	0.041	
15	0.33	0.62	.....	0.057	0.025	0.024	0.021	
16	0.35	0.56	0.182	0.027	0.020	0.005	0.008	
17	0.41	0.52	0.026	0.032	0.023	0.019	0.014	
18	0.44	....	.....	.....	.....	0.029	0.025	
19	0.54	0.69	0.085	0.022	0.024	0.003	0.003	Mean—
20	0.55	0.97	.....	0.055	0.011	0.016	0.017	Carbon, 0.52
21	0.55	....	.....	.....	.....	0.020	0.020	Oxygen, 0.021
22	0.61	0.74	.....	0.053	0.021	0.038	0.044	
23	0.66	0.65	0.100	0.033	0.052	0.005	0.006	Mean—
24	0.75	0.38	0.025	0.025	0.022	0.025	0.026	Carbon, 0.81
25	0.82	0.67	0.096	0.030	0.028	0.004	0.007	Oxygen, 0.011
26	1.00	0.67	0.036	0.016	0.025	0.006	0.007	Mean of all— Oxygen, 0.0189

A necessary and important consequence of low-oxygen content, if the determination of oxygen be made by the method used, is that the gas content must also be very low, at least in respect of carbon monoxide and dioxide. It has been shown that the oxides of carbon are reduced to water under the conditions of the experiment; and consequently carbon monoxide and carbon dioxide contained in the steel, or given off from it on heating, are reduced, and their oxygen appears in the final result.

If a steel gives off its own volume of carbon monoxide on heating, the oxygen in the gas represents an amount equal to 0.0091 per cent, a similar amount of carbon dioxide representing 0.0182 per cent. This conclusion is not invalidated by the fact that the steel is used in the form of fine turnings, as, although gas may be lost during the operation, the oxides of carbon are invariably practically absent from the gases obtained, which consist of nitrogen and hydrogen.

T. Baker examined two ingots of the same steel, to one of which aluminum had been added before casting, and gives the analyses shown in Table III. The oxygen percentage is calculated from the volume and composition of the gases.

Table III.

PER CENT OXYGEN CALCULATED FROM GASES IN STEEL.

(1) Free from blowholes.

	Per cent.
C	0.900
Mn	0.096
Si	0.088
S	0.023
P	0.019
Al	0.033
Volumes of gas per gram of steel.	1.326
Composition of gas:	
CO_2	1.68
CO	45.54
H	52.00
CH_4	0.72
N	0.08
Oxygen indicated	0.0810

(2) With blowholes.

	Per cent.
C	0.810
Mn	0.050
Si	0.080
S	0.028
P	0.019
Volumes of gas per gram of steel.	0.665
Composition of gas:	
CO_2	0.84
CO	42.41
H	54.60
CH_4	1.72
N	0.46
Oxygen indicated	0.0366

These results are somewhat startling as indicating that sound steel contains a higher proportion of oxygen than unsound, a result which would be remarkable in the light of accepted views on the subject. In attempting to account for the very high figures for the gas-content of steels obtained by Baker, the authors have been struck by the fact that the Toepler pump used in the extraction of the gases was unprovided with a drying tube. It is well known that it is impossible completely to remove water vapor along with the gases from any space by means of a mercury pump without this adjunct. Since water vapor would not reveal itself in the blank determinations when steel was not present, and its presence could only be detected by means of a manometer, which was not included in the apparatus, it is possible that practically the whole of the gases obtained resulted from the action on the steel of water vapor present in the apparatus and from the surface moisture on the metal. This opinion is supported by the evolution of large quantities of hydrogen at low temper-

(*Continued on page* 141.)

The Logic of the One Story Factory

Lofty Multi-Storied Buildings Are Impressive, But Manufacturers Should Consider the Advantages of Getting Down to Earth

BY G. D. CRAIN JR.

ONE of the hardest things for some manufacturers to learn is that it costs money to handle material. Putting it a little differently, one of the first things the ambitious manufacturer wants to see is a plant rearing its head three, four or five stories in the air, making a splendid and impressive pile which will attract attention to him and his business.

That is a natural ambition, and the erection of a multi-storied building seems to be the logical fulfillment of a successful career in the industrial field. Except in certain cases, however, there is no more reason why a factory should be more than one story high than there is for trying to confine a down-town department store to a single level.

The one-story factory building is getting to be more and more the ideal toward which designers and manufacturers are working. It is coming to be realized that the erection of a tall building for manufacturing purposes is almost certain to be extravagant in the end if it is not immediately wasteful. It is possible that the taller building constitutes a good advertisement for the concern which occupies it, but even this doubtful advantage is offset by the greater area and consequently more imposing horizontal dimensions of the one-story building. There are certain concerns whose interests require them to be located in the business or central districts of their communities, resulting in the purchase of factory sites at large figures. In such a case it is absolutely necessary to go up in the air. Ground costs too much. But in how many other cases is it true that where the manufacturer can buy land at acreage prices, and practically an unlimited amount at a reasonable figure, he persists in using the plan which is forced on the down-town concern, and calls for a building which will be numerous stories high!

Keep Down to Earth

There are a few concerns outside of those suggested which need tall buildings, these including plants where the material is lifted up and then brought down by gravity to a greater or less extent. But elevation for manufacturing purposes is not as a rule necessary, and there are many manufacturers who have high buildings when such a factor does not enter at all into the proposition.

Consider some of the reasons in favor of using a one-story building.

In the first place, lighting facilities are immensely superior. With the aid of sawtooth roofs covering almost every square foot of the factory, daylight can be introduced in sufficient volume to make artificial light unnecessary for the most part. Many large factories are compelled to use electric lights all day long in certain portions of their plants, because the machinery in these departments is too far from the windows, and transparent floors have not yet been invented. Artificial light is not desirable if sunlight may be had; it is merely a substitute, at best. In daylight the work is done better and there is less danger of accidents. The one-story factory certainly has many points in its favor from this standpoint alone.

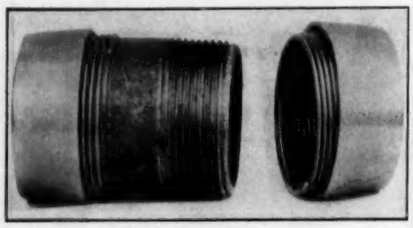
Handling expense, however, is one of the greatest arguments against going up in the air and in favor of getting down to earth. When you go above the first floor, you are performing two operations that are unnecessary—carrying the material up and bringing the product down. A logical scheme of manufacturing would take the material along straight lines as much as possible, with no obstacles in the way of elevators. These are real obstacles, representing delay in handling, in many cases, and likewise added expense in the way of labor and equipment.

Supervision of manufacturing operations can be carried on more readily where the entire business is concentrated on one floor. The superintendent, standing on a platform, can look out over the plant and tell what is going on much better than if his op-

(*Continued on page* 154b.)

A Flexible Thread Protector

DAMAGE to threaded ends of pipe, during shipment or storage, is frequent and costly. Edward James, Cleveland, O., has invented a flexible thread protector which, it is said, is inexpensive and may be readily attached or detached, but otherwise remains securely in place. It consists of a helically coiled wire, over one end of which a stamped metal cap is fitted. The inside diameter of the coil is a trifle less than the outside diameter of the threaded end of the pipe, on which the device fits. The inside diameter of the cap is large enough to let it slip over the coil before the latter has been placed in position for screwing on the pipe end. The portion of coil projecting from the cap is screwed over the pipe



HELICAL PIPE THREAD PROTECTOR

thread until nearly the entire coil is on. This spreads the portion of the coil within the cap so that it firmly grips the latter. This action is due to the expansion of the coil caused by screwing it on the thread and also by the thread's taper. The cap is removed from right hand threads by a half turn to the left with a pipe wrench. It is a smooth, tapered stamping and can be used repeatedly, having no threads to rust and being light in weight. The coil is removable only by pulling it straight away, and is not used again. It is made from round galvanized wire on an automatic machine. Use of the closed cap prevents large size pipe from collapsing at the exposed threaded end when dropped in unloading or otherwise, an accident which has frequently wasted much time and money.

How Paints Prevent Electrolysis

Record of a Series of Experiments on Steel Rods Embedded in Concrete—Films Impervious to Water Are Desirable

BY HENRY A. GARDNER

THE use of protective paints upon metal that is to be embedded in concrete structures, in order to prevent any damage which might be caused by electrolysis, has been heretofore proposed. No tests have been made, however, so far as the writer is aware, which have determined what type of coating is best suited for the purpose. It would appear, from first consideration, that a paint capable of forming a film of high electrical resistance would be most efficient for the purpose.

It has been observed that such films, however, generally present a high gloss surface and are apt to prevent the proper bonding of the concrete with the painted metal, thus doing more harm than good. It is chiefly for this reason that engineers have not generally adopted the use of paint upon reinforcing metal. In the experiments presented herein, a method for overcoming this objectionable feature of insulating paints is described, and data are presented on the relative insulating and bonding values of several different types of paint. The writer's investigations were made upon two separate series of concrete test cylinders. The first series were made by embedding in concrete cylinders painted iron rods ½ inch in diameter and 12 inches in length. The rods, previous to painting, were thoroughly cleaned from scale and rust. Two coats of paint were then applied, allowing a week's time for drying between coats. The painted rods were then placed in molds in an upright position, about an inch apart and 1 inch from the bottom of the molds. Cement mortar, prepared from one part of Portland cement and two parts of sand, was poured around the rods and tamped into place. After two days' time the molds were removed and the test pieces were repaired with cement mortar wherever defects were shown.

After aging for a month, the pieces were connected up in parallel and in series with resistance to reduce the voltage from 110 to 30 volts direct current. Current readings were made over a period of 24 hours. The current passing was small. The test cylinders were then placed in a shallow pan containing sufficient water to immerse the lower two inches of each specimen. After a week's test, the cylinders were disconnected and removed from the pan for observation. A few of the specimens showed small cracks near the bottom, where the wet cement had conducted the current to the greatest extent. The cylinders were then placed in separate earthenware jars and again connected up. The jars contained sufficient water to immerse the specimens up to within 1 inch of their top surfaces. They were left in circuit for ten days and current readings were made every 24 hours. Cracking was shown by nearly every cylinder which current readings proved to be carrying any appreciable amount of current. The fracture in every case started at the anode, extending radially to the edge of the cylinders and parallel to the electrode, gradually opening up as the tests were continued. The specimens were finally disconnected and removed for examination. Those which had been cracked by the electrolytic corrosion of the metal were easily split into two sections, disclosing the contained electrodes. The others, which did not show any cracking, were parted with a chisel in order to make a comparative examination of the condition of the embedded metal.

In Series II the specimens were made by embedding in concrete cylin-

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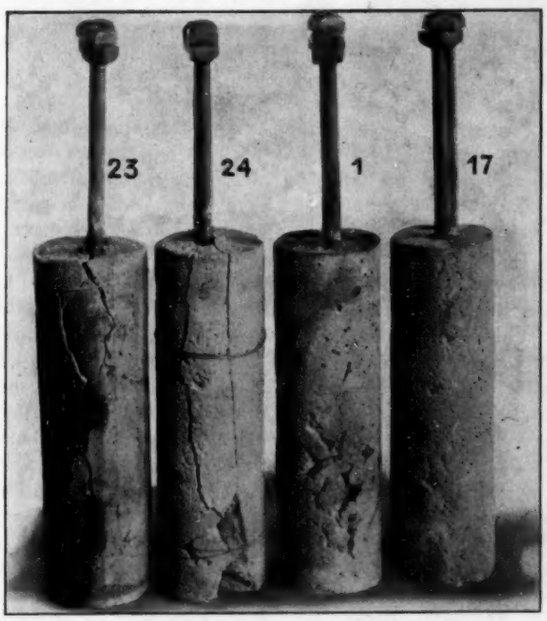


FIG. 1—RODS IN THE TWO CYLINDERS AT LEFT WERE UNPAINTED AND CONCRETE WAS CRACKED BY ELECTROLYSIS

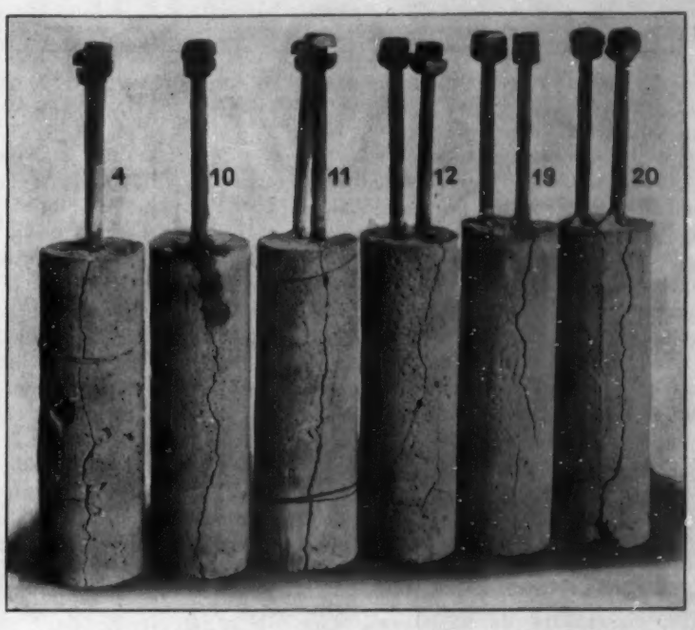


FIG. 2—ELECTROLYTIC TESTS OF RODS COVERED WITH AQUEOUS PAINTS

ders painted anodes ¾ inch in diameter and 12 inches in length. The rods, previous to painting, were thoroughly cleaned from scale and rust. They were painted with two coats of the same paints used in Series I. The rods were placed in molds 3½ inches by 8 inches, in an upright position, and the same kind of Portland cement mixture as used in Series I tests was placed around the rods and tamped into place. The specimens for this series were very carefully prepared and presented a much better appearance than those used in Series I. After setting for two days, the molds were removed from the pieces, which were then aged for a month. They were then placed in water for 24 hours, and the next day were placed in individual earthenware jars containing sheet-iron cathodes coiled so as to surround, but not touch, the cylinders. The jars were filled with sufficient water to cover the cylinders up to within 1 inch of their top surfaces. The specimens were connected up as in Series I. The tests were continued for 240 hours at 30 volts, during which time Nos. 4, 10, 11, 13, 15, 19 and 24 had developed cracks. The voltage was then increased to 55 and continued for 60 hours, at which time the tests were discontinued.

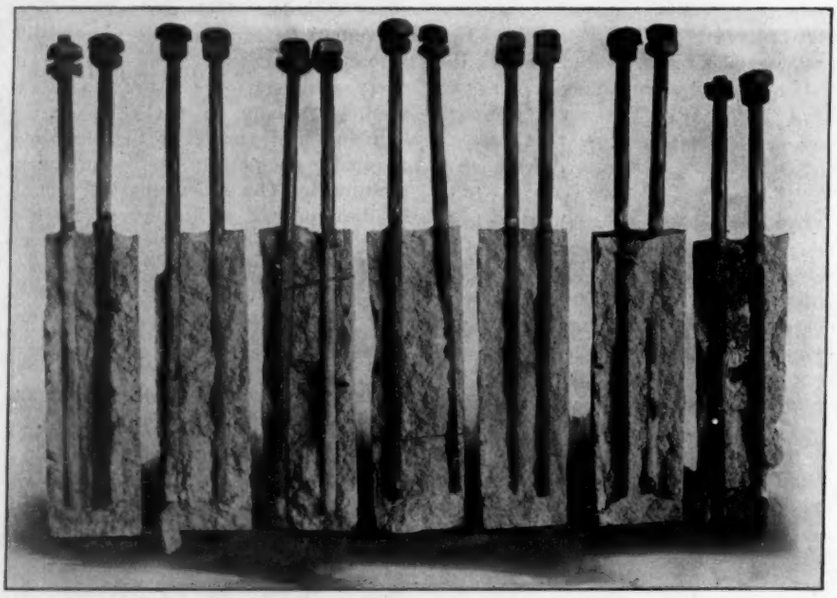


FIG. 3—TEST CYLINDERS SPLIT TO SHOW VARIOUS STAGES OF CORROSION

Incidental Reactions

The breaking down of a film upon the embedded iron rods was always recorded by a sharp rise in the amperage, due to the decreased resistance offered to the flow of the current between the electrodes. It was also recorded by a fizzing sound, due to the increased evolution of hydrogen gas developed by the electrolysis of the water in the damp concrete. This gas, issuing from around the iron electrode at the top of the test pieces, generally carried some water with it, and small bubbles were formed, which burst with an audible explosion when a lighted match was placed in contact with them. The hydrogen gas seemed to have a reducing or softening action upon some of the oxidized coatings, and carried to the surfaces of the cylinders considerable quantities of soft oily products, which deposited around the anode and later hardened in contact with the air. Iron oxide was also carried to the top surfaces of some of the specimens by the action of the gas and water, and was there deposited as a dark brown stain. That the nature of the paint films has considerable bearing upon the action of the hydrogen gas which was found to be developed during the tests there can be no doubt. In an investigation to determine the cause of the rapid corrosion exhibited by some grades of lacquered tin food containers, W. H. Walker and Slade have found linseed oil films to act as depolarizers of hydrogen, and Walker points out that such films, if in a semi-oxidized condition, may absorb hydrogen quite as rapidly as oxygen. This may account for the appearance of the oily substances brought to the top of some of the cylinders. Electrolytic hydrogenation may have been effected by the action of the nascent hydrogen in the presence of iron oxide or other pigments which could act as catalyzers. The action was sufficient to produce a substance which, although fluid when formed, on account of the warmth of the cylinders at the anode where heat was developed by the electrolysis, later became solid when deposited upon the surface of the cylinders. It was in specimens showing such surface deposits that the bond between the cement and steel was the weakest.

Walker has also referred to the fact that paint films that have been baked, on account of their fully saturated condition, do not act as depolarizers. It would obviously be impractical to bake paint coatings upon most forms of reinforcing metal, but quite thoroughly oxidized coatings, which would probably have but slight depolarizing action, would result by allowing a period of 60 days for the drying of oil paints after application to the metal and previous to immersion in the cement. It is, moreover, possible to apply coatings which do not depend entirely upon oxygen absorption for their hardening and which contain ingredients of a fairly saturated nature. Among these could be mentioned such coatings as are composed of resins dissolved in volatile solvents, as well as some special types of oil coatings which gave good results in Series I and II.

The small current flow shown by certain of the specimens in the test may in part be attributed to their impervious character. Paints which form porous films allow the passage of water which may contain various electrolytes. Such films offer but small resistance to the passage of electrical currents. Paints which form highly impermeable films keep water away from the underlying iron and offer great resistance to the passage of electrical currents.

Use of Pigments

It is quite likely that the nature of the pigment used in a paint designed to prevent electrolysis of embedded metal will have some bearing upon the results obtained from its use. The addition of a pigment to an oil usually increases the resistance to moisture and makes a more impermeable film. Theoretically, pigments which are of a non-conducting nature should be preferable. The inert pigments are examples of this type, such as asbestine, china clay, silica, etc. There should, however, be present in a paint a sufficient quantity of rust-inhibitive pigment, basic pigments or pigments of the chromate type, to produce a passive condition of the steel, similar to the condition that is produced by the basic lime compounds in cement.

Prominent among the protective compounds that gave the best results

(*Continued on page* 154b.)

Effect of Oxygen

(*Continued from page* 137.)

atures in Baker's experiments. The balanced reaction

$$4H_2O + Fe = Fe_3O_4 + 4H_2$$

takes place practically completely from left to right between 200 to 300 degrees Cent. This explanation is rendered more probable by the fact that other workers on this problem have found a primary evolution of carbon dioxide in all cases, and by the fact that in the sound-steel gases the ratio $H_2 : O_2$ is almost exactly 2 : 1 by volume. The carbon monoxide could be accounted for by subsequent reduction of the oxide by the carbon of the steel.

By dissolving steel in acid copper-potassium-chloride solution Goutal obtained the figures given below as the percentage of oxygen:

Steel.	Carbon, per cent.	Oxygen, per cent.
Medium soft	0.2867	0.0220
Hard	0.6375	0.0573
Extra hard	1.3775	0.0656

It will be noticed that the oxygen present increases in this case with the carbon content, and reaches the high value of 0.0656 in the case of the highest carbon steel, a result which is remarkable enough to justify a more complete investigation.

Belloc, working on basic open hearth steel of the following composition: Carbon 0.12 per cent, manganese 0.36 per cent, silicon, 0.3 per cent, sulphur 0.02 per cent, and phosphorus 0.018 per cent, obtained 0.0309 per cent oxygen by calculation.

Approves Plans of Toledo Furnace Co.

The East Side Commercial Club, Toledo, O., at a recent meeting passed resolutions favoring the building of the coke ovens by the Toledo Furnace Co., according to plans now being carried out by the concern. The club at a meeting held some time ago protested the building of the coke ovens on account of the smoke and dirt which was feared would result. A committee of investigation concluded, however, that if the ovens were properly constructed in an up-to-date manner, there would be no resultant smoke and dirt and that the establishment of the coke ovens and the consequent cheap gas would prove a benefit, especially as it was intimated that the Toledo Furnace Co., had other and larger projects for improvement in mind when the cheaper fuel became a reality here. It was stated in a letter received from Pickands, Mather & Co., that the company expects to employ between 300 and 400 men. He also said that it was the plan to save the gas and other by-products, so that gas would be sold to other plants, thus actually lessening the amount of smoke rather than increasing it. Members of the club were assured that the lowest wage paid at the coke ovens would be 24 cents an hour.

Largest Gain

Since October, 1912, Made in June in Corporation Orders

The largest single monthly gain in the orders upon its books since October, 1912, or 413,598 tons was shown by the Steel Corporation in its monthly statement issued at New York, July 10. This compares with previous gains of 411,928 tons in January, 1915, and 412,760 in February, 1914, but during neither of these two months did the operating and shipping position of the Corporation approach the high rate maintained in June just past, when production averaged about 85 per cent of ingot capacity. The June showing unquestionably is the best the Steel Corporation has made in more than two years and latest reports indicate that heavy incoming new tonnage has been fully maintained in July to date. The unfilled orders on June 30 are shown to have been 4,678,196 tons, compared with 4,264,598 tons on May 31.

Date.	Total.	Change, tonnage.	Change, per cent.
June 30, 1915....	4,678,196	413,598+	9.69+
May 31, 1915....	4,264,598	102,354+	2.46+
Apr. 30, 1915....	4,162,244	93,505—	2.21—
Mar. 31, 1915....	4,255,749	89,622—	2.06—
Feb. 28, 1915....	4,345,371	96,800+	2.28+
Jan. 31, 1915....	4,248,571	411,928+	10.74+
Dec. 31, 1914....	3,836,643	512,051+	15.40+
Nov. 30, 1914....	3,324,592	136,505—	3.94—
Oct. 31, 1914....	3,461,097	326,570—	8.62—
Sep. 30, 1914....	3,787,667	425,664—	10.01—
Aug. 31, 1914....	4,213,331	54,742+	1.32+
July 31, 1914....	4,158,589	125,732	3.12+
June 30, 1914....	4,032,857	34,697+	0.86+
May 31, 1914....	3,998,160	278,908—	6.98—
Apr. 30, 1914....	4,277,068	376,757—	8.09—
Mar. 31, 1914....	4,653,825	372,615—	7.42—
Feb. 28, 1914....	5,026,440	412,760+	8.95+
Jan. 31, 1914....	4,613,680	331,572+	7.74+
Dec. 31, 1913....	4,282,108	114,239—	2.59—
Nov. 30, 1913....	4,396,347	117,420—	2.60—
Oct. 31, 1913....	4,513,767	490,018—	9.79—
Sep. 30, 1913....	5,003,785	219,683—	4.24—
Aug. 31, 1913....	5,223,468	175,888—	3.03—
July 31, 1913....	5,399,356	407,965—	7.03—
June 30, 1913....	5,807,317	517,005—	8.18—
May 31, 1913....	6,324,322	654,440—	9.38—
Apr. 30, 1913....	6,978,762	490,194—	6.55—
Mar. 31, 1913....	7,468,956	187,758—	2.45—
Feb. 28, 1913....	7,656,714	170,654—	2.18—
Jan. 31, 1913....	7,827,368	104,796—	1.32—
Dec. 31, 1912....	7,932,164	79,281+	1.01+
Nov. 30, 1912....	7,852,883	258,502+	3.40+
Oct. 31, 1912....	7,594,381	1,042,874+	15.33+
Sep. 30, 1912....	6,551,507	388,132+	6.29+
Aug. 31, 1912....	6,163,375	206,296+	3.46+
July 31, 1912....	5,957,079	149,773+	2.58+
June 30, 1912....	5,807,346	56,363+	0.98+
May 31, 1912....	5,750,983	86,983+	1.52+
Apr. 30, 1912....	5,664,885	360,044+	6.97+
Mar. 31, 1912....	5,304,841	149,359—	2.79—
Feb. 29, 1912....	5,454,200	74,479+	1.38+
Jan. 31, 1912....	5,379,721	294,960+	5.71+
Dec. 31, 1911....	5,084,761	942,806+	23.24+
Nov. 30, 1911....	4,141,955	447,627+	12.06+
Oct. 31, 1911....	3,694,328	83,011+	2.25+
Sep. 30, 1911....	3,611,317	84,668—	2.34—
Aug. 31, 1911....	3,695,985	111,900+	3.33+
July 31, 1911....	3,584,085	223,027+	7.16+
June 30, 1911....	3,361,058	247,871+	7.96+
May 31, 1911....	3,113,187	105,617—	3.28—

Asked to Visit Youngstown

President James A. Campbell, of the chamber of commerce, Youngstown, O., has sent an invitation to the federal trade commission at Washington to include Youngstown in its tour it is to make of the principal cities of the country. It was pointed out in the invitation that should the commission visit Youngstown, the chamber of commerce would arrange to have the commission meet the prominent manufacturers, bankers and business men of the Mahoning and Shenango valleys of Ohio and Pennsylvania, respectively. The commission is making the trip to obtain first hand information on business conditions and problems in all of the great centers of industry of the United States. It has already conducted hearings in Boston and New York. The commission thinks that the tour will save it and litigants who appear before it much time and expense. It is probable various business and trade organizations will be notified of the commission's coming that a committee may be named to escort the commission and to present whatever information is available for its use. The list of cities tentatively named in connection with the forthcoming itinerary are: Pittsburgh, Cincinnati, Cleveland, Detroit, Indianapolis, Chicago, St. Louis, Milwaukee, Minneapolis, St. Paul, Spokane, Tacoma, Seattle, Portland, San Francisco, Los Angeles, Denver and Kansas City.

Acquires Neil Machinery Co.

Fairbanks, Morse & Co., 30 Church street, New York, have acquired the business of the Neil Machinery Co., George E. Neil, head of that company, becoming manager of the machine tool department of Fairbanks, Morse & Co. The agencies which thus pass into the control of Fairbanks, Morse & Co. include those of the Lees-Bradner Co., Cleveland, Kern Machine Tool Co., Hamilton, O., Springfield Machine Tool Co., Springfield, O., Colburn Machine Tool Co., Franklin, Pa., and the Bridgeford Machine Tool Co., Rochester, N. Y. Fairbanks, Morse & Co. also announce that W. V. Gould, for many years with the Jones & Lamson Machine Co., has associated himself with their machine tool department.

The Pittsburgh Iron & Steel Foundries Co., Pittsburgh, is installing a 25-ton acid open hearth furnace in its plant at Midland, Pa. The plant is operating at maximum capacity.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

Edward S. Knisely, the newly appointed general sales agent for the Bethlehem Steel Co., South Bethlehem, Pa., belongs to the class of salesmen who know the products which they sell because they helped to manufacture them. Mr. Knisely's first work with the Bethlehem Steel Co. was during the three years from 1890 to 1893, when he served as an apprentice. He then entered Lehigh University and spent three years in the engineering department, after which he returned to the mill and acted in various capacities from sub-foreman to chief inspector, doing special work in the efficiency department. He entered the sales department in 1901, was placed in charge of the Pittsburgh office in 1904, and a year later was appointed western sales representative, having in charge all the western offices. He continued in that position until appointed general sales agent.

EDWARD S. KNISELY
General Sales Agent, Bethlehem Steel Co., South Bethlehem, Pa.

Dr. Rukard Hurd has resigned as secretary of the Minnesota tax commission to accept the higher position of director of the department of mines and mineral taxation. The commission has created the new office for the department which Dr. Hurd built up and of which he has had sole charge since the commission was created in 1907. It is the most important department of the commission and has grown to such an extent that the commission desires him to devote all his time to it. Dr. Hurd is a man of tremendous energy and much ingenuity. He has become a recognized authority on iron ore values and taxation. His honorary degree of doctor of philosophy was presented to him in behalf of the board of trustees of the

DR. RICHARD HURD
Director Department of Mines and Taxation, Minnesota Tax Commission

Pennsylvania Military College by the late John Birkinbine. Dr. Hurd expects to finish his new edition of his Iron Ore Manual within six months.

Roy C. McKenna has been elected president of the Vanadium Alloys Steel Co., Pittsburgh, succeeding E. T. Edwards, who resigned to accept the presidency of the Latrobe Electric Steel Co. Mr. McKenna has had valuable experience as head of the mechanical department of the McKenna Bros. Brass Co., Pittsburgh. He is a graduate of the University of Pittsburgh, class of 1903, in mechanical and electrical engineering. Mr. Edwards will continue as a director of the Vanadium Alloys Steel Co.

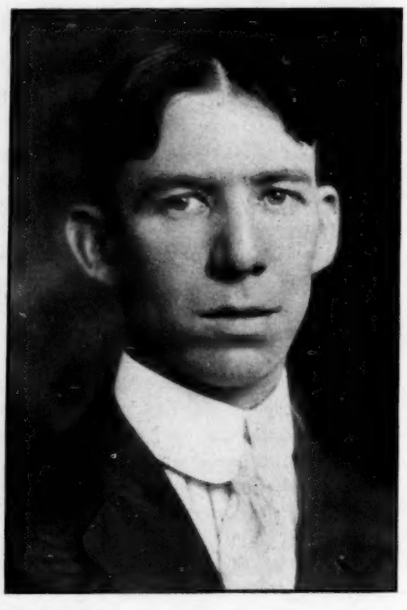
Oliver Phelps, widely and favorably known in the iron trade, who for many years was engaged in the sale of pig iron in the Detroit and Michigan territory, has established an office at 1516 Ford building, Detroit, as a manufacturers' agent. He will represent the Dayton Malleable Iron Co., Dayton, O., and would like to communicate with other manufacturers having attractive accounts to offer with reference to representation in Detroit and throughout the state of Michigan.

F. N. Perkins, president of the Foundry & Machine Exhibition Co., with headquarters at the Lewis Institute, Chicago, and who was a representative of the Arcade Mfg. Co., molding machine manufacturer, Freeport, Ill., for many years, has resigned the latter connection to enable him to devote more attention to the affairs of the exhibition company.

James Reynolds, of Philadelphia, formerly of South Bethlehem, Pa., has been made superintendent of the Thurlow Steel & Forge Co., Chester, Pa.

J. F. McNamara has been appointed general manager of the Bayonne Casting Co., Bayonne, N. J., to succeed W. E. Oakley, vice president and general manager, resigned.

James Bowron, president of the Gulf States Steel Co., has left for a six weeks vacation in New York and northern points. It is stated that Mr. Bowron expects to visit Alaska before he returns to Birmingham.



ROY C. McKENNA
President Vanadium Alloys Steel Co., Pittsburgh

DETROIT'S GREAT GROWTH

DUE TO ITS OPEN SHOP POLICY

BY L. W. MOFFETT

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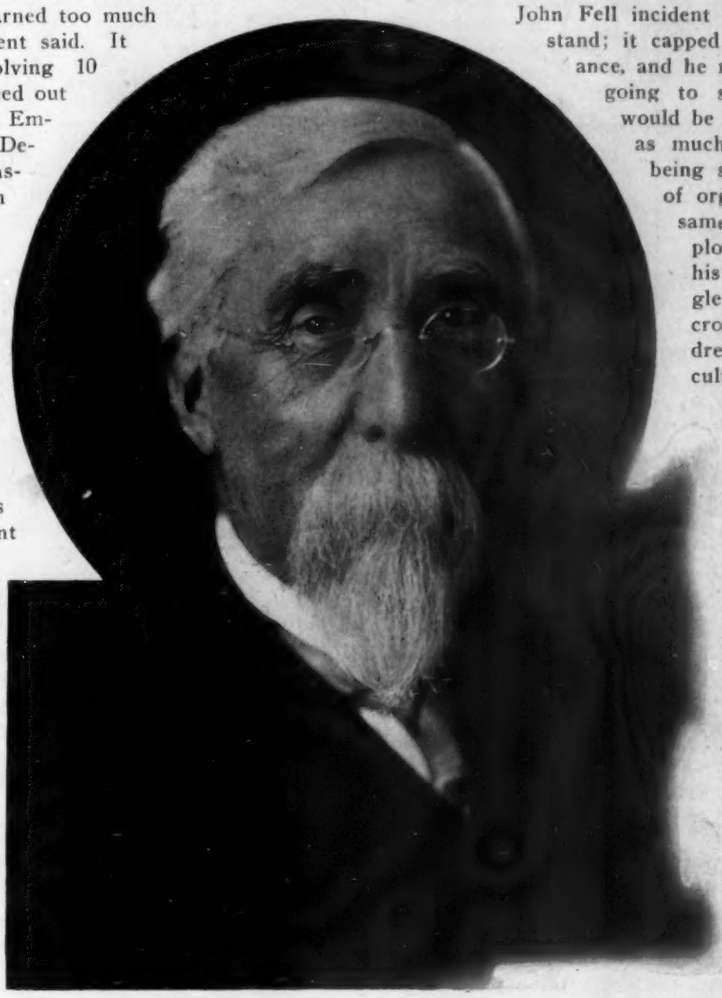
BACK in 1894, John Fell, member of the machine molders' union No. 244, Detroit, earned $2.60 in one day in the small foundry connected with the machine shop of the Leland & Falconer Mfg. Co.

Mr. Fell had grossly violated the law of the labor organization to which he belonged. That law, immutable as the laws of the Medes and Persians, said a member of the union must not earn more than $2.50 per day. For his energy and ambition by which he exceeded the limit 10 cents, Mr. Fell was summarily haled before the union tribunal and fined $50. Supt. Ben Gonnersell, of the Leland & Falconer plant, told Henry M. Leland, senior member of the firm, that Mr. Fell had been fined $50 by the union.

"Fined $50 by the union! For what?" asked Mr. Leland in astonishment. "He earned too much money," the superintendent said. It was this incident, involving 10 cents, that planted the seed out of which has sprung the Employers' Association of Detroit, by far the largest association of the kind in the world, situated in the greatest open shop city in the world, where laboring conditions for the employers and employes are well nigh ideal. The father of the association of the open shop in Detroit, and all of the many good qualities it represents, is Mr. Leland, now president of the Cadillac Motor Car Co., which today is employing 9,300 workmen, who are turning out a car known throughout the world as a high grade vehicle. It was he who nourished that seed, now ripened into an association of 280 manufacturers of Detroit, representing virtually all the important manufacturers of the city, who are today employing approximately 180,000 employes. To the Employers' Association belongs credit for the remarkable growth of Detroit, particularly marked the past 15 years. It took hold of the vexing labor troubles which, incited by organized labor's oppressive and dictatorial demands, had fixed themselves firmly and all but throttled the life out of the city.

Mr. Leland, who, in his own words, arrived in Detroit in 1890 from Providence, R. I., with scarcely sufficient capital to pay hotel expenses for one month, determined to start in business for himself. He always did and evidently always will abhor slavery in any form. Industrial slavery was monstrous to him, for he has been a lifelong admirer of quality and skill, of enterprise and aspiration, and all of these were being crushed by the tactics of organized labor in Detroit when he reached the city. The John Fell incident was more than he could stand; it capped the climax of his tolerance, and he made up his mind he was going to see to it that employes would be granted the right to earn as much as they could, without being subject to the domination of organized labor, and at the same time see that the employer had the right to run his own business. His struggle to this end, finally crowned with success never dreamed of, was most difficult, rough and tortuous.



HENRY M. LELAND

But, beside his insignificant capital, Mr. Leland had brought something which he omitted to mention. He brought integrity, intelligence, vigor and determination, and love of a square deal. To his surprise, Mr. Leland learned that the president and secretary of the union which fined John Fell were employed at his own plant. He called them in, gave them some friendly advice, pointed out to them that manufacturing is an art and that the more an employe earned the better he liked it—it was good for em-

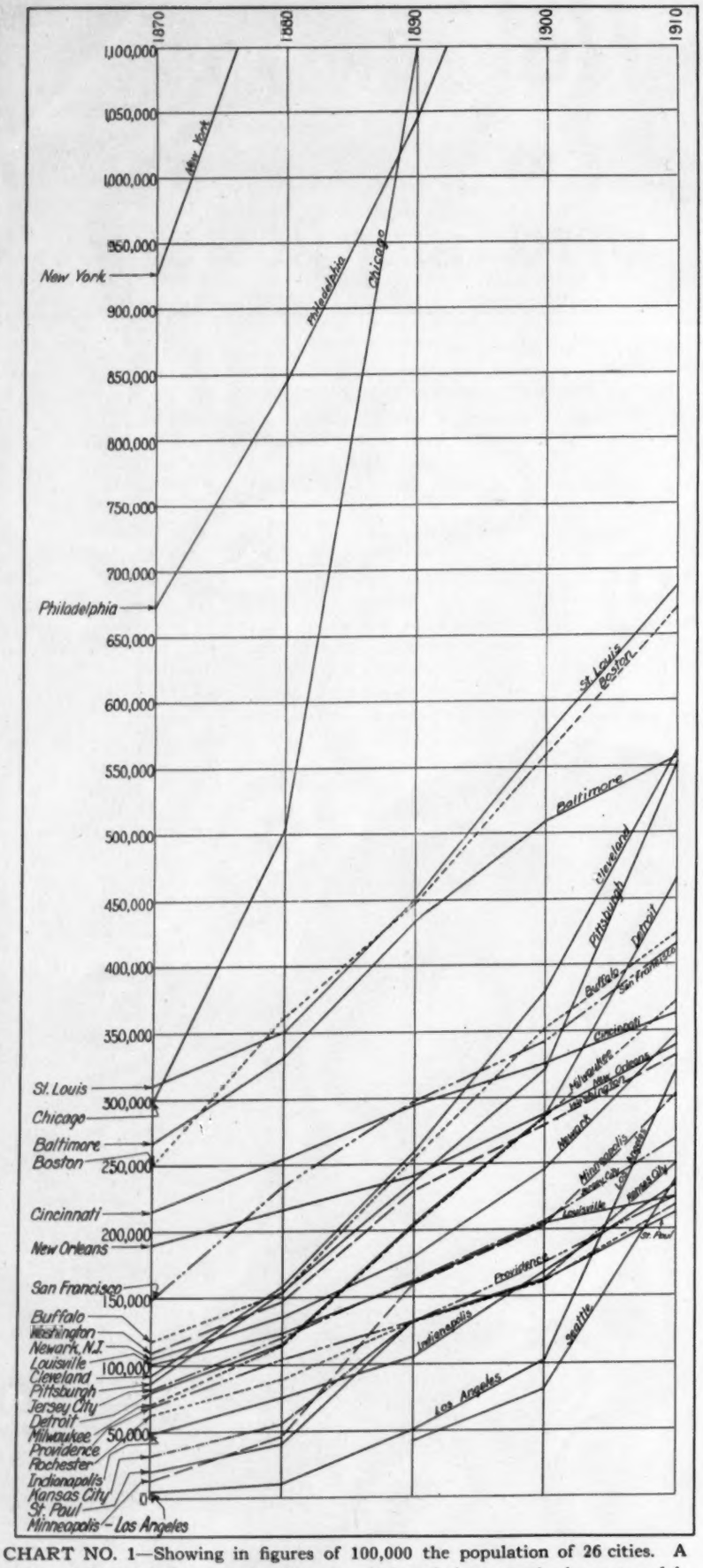


CHART NO. 1—Showing in figures of 100,000 the population of 26 cities. A glance at Detroit's line is a significant reminder of the pace she has set and is setting for rival cities. That city's growth is explained by its open shop policy.

ployer and employe alike. The union officers could not help seeing a light. The upshot of the matter was that the limit a member of the union could earn in a day was gradually raised until it reached $5, something of a concession on the part of the union, and finally the limit was done away with altogether.

Labor Oppressions Crushed

Other labor oppressions followed from time to time. One of them which spurred Mr. Leland to further action in his fight against tyrannical methods of organized labor concerned an employe in his plant, who had recently arrived from Canada, where, as an employer, organized labor had put him out of business. This workman was driven out of Detroit at night. Not a member of the union, he had applied for a card so that he might continue work and make a living, but the union, egged on by the antagonism he had engendered at the hands of brother unionists in Canada, instead of issuing the card, began persecuting the applicant. Life was made unbearable, and, moreover, the employe, in danger of bodily harm, and to save himself, left Detroit under cover of darkness.

Then Mr. Leland firmly conceived the idea of an employers' association. He had been in Detroit only four years, and did not have the confidence of other employers, because he was unknown to them. Today it is almost amusing to think of Mr. Leland not having the confidence of any one who knows him, for a man more highly respected than Mr. Leland, both as a citizen and employer, does not live.

Labor troubles, because of intolerable demands from the unions, came on apace. Contracts and agreements were made with the unions which treated them as mere scraps of paper, violating their terms at their own pleasure.

Mr. Leland first talked to founders and machine shop men about getting up a local employers' association, to fight fire with fire. Trouble was feared by other employers and Mr. Leland was discouraged, but not defeated. Other meetings with employers were held, and finally, Mr. Leland, recommended by his partner, R. C. Falconer, living up in the north, as a safe and reliable man, succeeded in getting seven employers' promises to enter the association. By continued hard work, Mr. Leland, in 1897, had obtained 11 members for the organization.

These details are related at some length to denote the humble beginning of the Employers' Association of Detroit. Great impetus and encour-

agement were given to the association through the vigorous effect enjoyed by the organization in Detroit of the National Foundrymen's Association, followed 10 months later by the National Metal Trades Association. Credit for the organization of these associations, said Mr. Leland, is largely due to some well known Detroiters. His high regard for both associations was signified by Mr. Leland when he asserted emphatically that they had saved the country from industrial chaos. The destructive and ruinous policy of the closed shop, said Mr. Leland, was done away with by those organizations.

In 1894, there was only one open shop foundry in Detroit. Today, aside from the stove shops, a union shop is as hard to find in Detroit as was an open shop in 1894.

Once started, the manufacturers of Detroit soon learned the value of cooperation, and the Employers' Association today represents a compact body of big business men, always standing and acting together, who have reduced the labor problem to a science. It metes out justice to both employer and employe. It embodies the golden rule, applied to business, and, if proof of its standing is required, it is only necessary to say it has the complete confidence of the army of workmen of Detroit, who would not return to the old conditions under any inducement. Its membership is a roster of honest, broad-minded men. Its sustained success is due to the efforts of all who belong to it. Among others who have contributed to its high standing is John Trix, president of the American Injector Co., and formerly president of the association.

"All Americans who desire to work in Detroit are given a chance," said Mr. Trix, "and by Americans I mean not only native born, but those who have accepted this country as their home. Any employe, no matter how humble his position, may come into my office. I encourage them to do this, and find, through getting into personal contact with them, understanding them, and allowing them to understand me, that mutual benefit is derived. Moreover, I find I can learn from all of them, from the office boy up. It is the most satisfactory way to settle any misunderstanding, avoiding unpleasant relations, strikes and other disputes. It has put the union business agent out of business. The shop committee no longer presents arbitrary demands, resulting in differences injurious to employer and employe alike. The workmen are more loyal and stand ready to pull their employer out of any hole.

"I have no objection to labor unions themselves. But I do object to labor unions telling me how I shall run my business. A man's religion or politics is nothing to me. When a man comes to my plant for employment, I ascertain if his character and laboring record are clean. Especially if he comes from a closed shop city, I tell him my plant is run according to the open shop system and give him every chance possible to make good."

Square Deal is Policy

The declaration of principles adopted by the association, along with its constitution and by-laws, epitomizes the square deal between employer and employe. They propose that the employer shall not be unjust to his employe, nor the employe unjust to his employer. If an employer is found to be wrong in any dispute he may have with his men, he is told of it and a plan for adjudication is arranged by

Will Contest With Cleveland for Rank of Sixth City

Detroit, ninth in population, full of vim and with practically no labor trouble, has entered the field to wrest the title of sixth city from Cleveland in 1920. So full of confidence are Detroiters that their city is destined to attain this rank that they have already ceased giving consideration to Baltimore and Pittsburgh, seventh and eighth in population, respectively, as rivals. They recognize nothing below Cleveland as being worthy their steel. The open shop policy, as supported by the Employers' Association of Detroit, has taken that city out of the sluggard class and made of it a rising star in the census constellation. With this sane labor policy prevailing, Detroit has gained a strong advantage over sister cities now ahead of it and justification for her claim of forthcoming supremacy may well deserve consideration. Cleveland, which has made such a remarkable growth since 1900, has been and is being handicapped by tyrannical labor unionism. Unless the present sixth city throws off this yoke, Detroiters think she will have to take a back seat and let their city become sixth by 1920.

Chart No. 2 shows percentages of gains made by eight cities from 1900 to 1910. It will be observed that, with one exception, Detroit showed by far the greatest gain, making an increase of 63 per cent. Pittsburgh, the exception referred to, made a gain of 70 per cent, but this, of course, is accounted for by reason of the fact that Pittsburgh added Allegheny to its population during the decade. Baltimore made a gain of only 9.8 per cent between 1900 and 1910 and seems to be out of the running. Cleveland made the remarkable gain of 47 per cent. But the vast difference between this increase and that of Detroit emphasizes the potential possibilities of Detroit's open shop system as compared with Cleveland's hampering by labor union domination.

Chart No. 1 shows cities ranking from first to twenty-sixth in population in 1910 and their growth since 1870. The population of New York, Philadelphia and Chicago after they had reached the 1,100,000 mark, is not shown. Lines denoting those cities, therefore, are not drawn down to 1910. A glance at the chart will show how closely grouped were 11 cities in 1870, among them being Milwaukee, Detroit, Jersey City, Pittsburgh, Cleveland, Louisville, Newark, N. J., Washington and Buffalo. Out of that list today only two cities, Cleveland and Pittsburgh, excel Detroit in population. A glance at Detroit's line will show the stride it has set, passing seven cities since 1870. Beginning with 1880, Milwaukee and Detroit had virtually the same population, there being a difference of less than 1,000. They ran shoulder to shoulder until 1900, when Detroit advanced sharply, while Milwaukee gained only moderately. In 1910 Detroit had a population of 465,766, as compared with 377,857 in Milwaukee. The chart also shows how and when Detroit passed seven cities since 1870.

the executive committee of the association, represented by a manufacturer of each of the industries affiliated with the association. If the employer refuses to comply with the finding of the committee, he loses his membership. If the employer is found in the right, then the association will go to any expense before it will yield to the demands of the discontented employes. No employer who is a member of the executive committee can vote for a plan of settlement of any trouble in his own plant. The action of the other members of the committee is the determining factor.

"You see," said Mr. Trix, "an employer who is having trouble at his plant is like a man who has been hit on the nose—he can't see the situation from an unbiased point; he is prejudiced and angry. So the association doesn't permit him to vote."

Expenses of the association are defrayed by assessments levied upon members and associate divisions, arranged according to the respective industries, and payable quarterly in advance. The assessment is divided into two funds. First, there is the general fund, to be used for ordinary expenditures of the association. Disbursements from this fund are under the control of the finance committee, subject to the executive committee. Secondly, there is the reserve fund, to be used for the purpose of meeting extraordinary demands. This fund cannot be drawn upon for any purpose whatever, except by authorization of the association at a regular or special meeting, acting upon a recommendation of two-thirds of the executive committee, both of which shall in every case limit the amount to be so withdrawn. Expenditures from such authorized withdrawals are made in the same manner as from the general fund. Entrance fees are placed to the credit of the reserve fund.

Paying Association Expenses

In creating and maintaining a reserve fund and caring for operating expenses of the association, each individual member and each member of an association division are assessed upon the basis of their pay roll for the preceding year, the amount of such assessment to be not less than $1.50 for each $1,000 of such pay roll. The proportion of the assessment to be allotted to each fund is determined by the executive committee. It is provided, however, that should the reserve fund be at any time drawn below $1 per operative in the employ of all individual members and associate divisions of the association, then the deficiency shall be levied in the succeeding quarterly assessments. Further provision is made that the minimum annual dues for an individual member and for each member of an associate division shall be $40. In the computation of pay rolls, members cannot include salaried officers, office help, technical staff, superintendents, general foremen and time clerks. It is imperative, according to the by-laws, that the membership of the association shall be divided into at least three divisions, each division composed of manufacturers having like interests, namely: The metal trades, brass manufacturers and founders. Additional divisions are provided for. Each chairman calls the members of his division together whenever matters of importance need their attention. These divisions discuss situations confronting them, and may determine upon a course of action, but, as pointed out, final authority rests with the executive committee. These divisions can take no action in matters affecting the principles of the association, or which may affect any of its members of divisions adversely, without first submitting the question to and obtaining the approval of the executive committee. An amendment provides that the maximum annual dues for an individual member, and for each member of an association division, to be paid into the general fund, shall be $800 per year. The present constitution and by-laws and declaration of principles were adopted Feb. 10, 1903, and revised and amended Dec. 18, 1906. The association was actually organized originally in 1897.

Any reputable manufacturer of Detroit or vicinity, upon recommendation of the executive committee, shall be elegible for individual membership, and, having received an affirmative vote of the association, may become a member by signing the roll and complying with the constitution and by-laws. Limited membership may be accorded in the same manner as prescribed for full individual membership to any organized body of employers in Detroit, representing not less than 100 operatives. Every organization is entitled to the services of the secretary and employment bureau of the association.

Is Labor Clearing House

Through its system, the association checks up every employe working in the plant of members, keeps trace of his personal and laboring record, and knows when and why a man left a job. When employes are needed, members of the association inform the secretary, who, with a record at his disposal, is able to say whether the required workmen are available and to recite their records. When a man wants work, he calls upon the association. It is a clean-cut method of introducing the man and the job with the least effort and expense. That is another factor in the satisfactory labor situation in Detroit, which has well earned its splendid reputation from manufacturing interests in this as well as in foreign countries.

The association itself directs any proper matter of dispute in which an associate division may become involved, paying the expenses in the same manner and to the same extent as for a division of the association. An entrance fee of $50 is paid by each applicant for individual membership and $35 for each member of an associate division. If any individual member or associate division becomes involved in labor troubles within 90 days after being elected to membership, the individual member or association division, before being entitled to financial assistance in the conduct of such labor troubles, shall pay into the treasury of the association such sum as shall be equal to the proportion of

Declaration of Principles, Employers' Association of Detroit

No discrimination shall be made against any man because of his membership in any society or organization.

Subject to any rights under contracts existing between them, it is the privilege of both the employer and the employe to terminate their relations whenever either sees fit to do so.

Since the employer is responsible for the work turned out by his workmen, he must have full discretion to designate the men he considers competent to perform the work and to determine the methods under which that work shall be performed, the question of the competency of the men, and the number of foremen, apprentices, helpers and handymen, etc., to be employed will be determined solely by the employer.

Employes will be paid by the hourly rate, by premium system, piece work, contract, or otherwise, as the employer may elect. No limitation by fellow employes, or any organization, of the quantity or value of work an employe may accomplish in a given time will be permitted or tolerated. Foremen shall be the agents of the employer.

In the operation of any system of hours or wages now in force or to be extended or established in the future, this association will not countenance any conditions which are not just or which will not allow a workman to earn a wage proportionate to his productive capacity.

the annual expense for the year just preceding that he or it would have paid, had membership been held in the association during such year.

Safety and Sanitation Recognized

This association then, it will be seen, exacts fair play from its members. With this given, they are supported without limit. It must not be thought that the association is organized merely to fight oppressive demands. That is only one objective. It also aids the employe. It teaches safety and sanitation. Elaborate safety first campaigns are conducted through speakers versed in that highly important subject. Workmen are constantly instructed by their superiors as to how to avoid accidents, devices for which are especially numerous in Detroit plants. An indication of what has been accomplished through this campaign is shown by the records at the plant of the Cadillac Motor Car Co. Industrial accidents in that plant were reduced 73 per cent during the year from Sept. 1, 1913, until Sept. 1, 1914, as compared with the same period of the previous year.

All these conditions lend inviting circumstances to manufacturers outside who are contemplating changing locations to go to Detroit. Surprisingly large numbers of plants which have moved there the last decade and more testify to this fact. Always there are good prospects for Detroit to obtain more plants, and only recently a Wheeling, W. Va., concern moved there. Plants already established are continually adding to their capacity. Henry Ford is now talking of building a blast furnace, a steel plant and a farm tractor plant. The Employers' Association and the Board of Commerce, which co-operates with it, entertain business delegations regularly, showing them through the great industrial institutions, whizzing them about in autos, and giving them practical proof of the advantages of Detroit as an industrial and residential city.

Detroit, the Ideal Open Shop City

Since 1870, Detroit has outstripped seven cities in population: Buffalo, San Francisco, Cincinnati, New Orleans, Louisville, Newark and Washington, a record equaled by only two other cities, always larger than Detroit, Cleveland and Pittsburgh. Detroit, the ninth city, had a population of 465,766 in 1910, according to the federal census, and its estimated population on Jan. 1, 1915, was 600,000. In 1900, it had only 285,704; in 1890, 205,876; in 1880, 116,340, and in 1870, 79,580. At its present rate of remarkable growth, which promises to increase rather than slacken, it will pass one or two cities now ahead of it unless those cities awaken to their interests. The Employers' Association and the open shop are the answer. Census figures show in a peculiarly interesting way that, with few exceptions, it is the open shop cities which are making such remarkable gains in growth, whereas the closed shop towns as a rule are showing virtually no progress and are being passed.

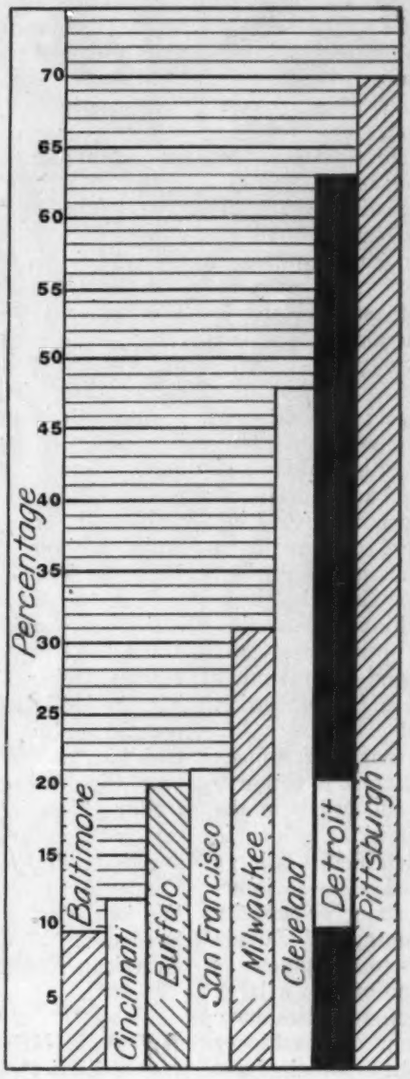


CHART NO. 2—Showing the percentage of gains made by the cities indicated, from 1900 to 1910. Aside from Pittsburgh, which increased 70 per cent, the greatest advance was made by Detroit, which increased 63 per cent. Pittsburgh's large showing is due to the fact that Alleghany was merged with that city since 1900.

The open shop lends to the efficiency of a manufacturing plant and its employes. That is so because restrictions as to hours, output and wages are thrown in the waste basket. Employes are released from the shackles of hampering rules and regulations ordinarily meant for a machine rather than a human being with ambition, body, mind and soul, intended to be used by the employe for himself and family, as well as to better his employer. Wages in Detroit are far above the average paid in the United States—or in the world for that matter. The hours rank well with those of the average American city, and perhaps are somewhat less. It is probably true that more homes are owned and are being bought by Detroit employes than any other class of employes in the country. Strikes in industrial plants are so rare that they are hardly known. It is interesting to view this situation and compare it with the strikes, slugging and general miscarriage of justice which characterize labor in other cities. The recent review by the chamber of commerce of violence in labor disputes in Cleveland stands out in remarkable contrast to conditions which have been and are prevailing in the open shop city of Detroit. Likewise labor union violence throughout other sections offer equal study of the Detroit plan, which other cities would do well to master and adopt. While other cities have been tied up temporarily with labor troubles, Detroit has moved along steadily and swiftly.

Tremendous Business Done

Over 700,000 motor cars—perhaps 750,000—will be produced in Detroit this year, according to statistics compiled and just issued by the Detroit tourists and convention bureau. The estimate is said to be conservative.

In all, there are 34 well known automobile manufacturing concerns in Detroit. Plants devoted to the production of automobile parts and accessories number more than 100, and probably about 40 per cent of the workmen employed in Detroit are engaged either in automobile or accessorial plants. The capital invested in the motor car industry is approximately $110,000,000 in Detroit, and the total number of employes at this season of the year is placed at 125,000. The value of the motor car output will aggregate something over $500,000,000. Figures issued by the government show that Detroit was third in the list of export centers for the week ending June 19, the position it promises to maintain, if it does not excel, it soon. New York was first and Norfolk, Va., second. In spite of the tremendous increases in exports from Boston, Baltimore, Savannah, Ga., Galveston, Tex., Philadelphia, New Orleans, San Francisco and other seaports, none came within $1,000,000 of Detroit's total, $3,296,572.

Railroads Act on Requirements

Burlington Railroad Closes for Part of Its Inquiry—Seaboard Air Line Issues Large List—Domestic Demand Weakens at Some Centers

WHILE DEMAND for all kinds of equipment to manufacture munitions of war, continues to hold the center of the stage in the machine tool market, much interest now attaches to the sudden improvement in demand from the railroads. During the first half of this year, practically all of these interests bought sparingly and only a few roads made purchases of importance; furthermore, the inquiries which came out were not of such a nature as to indicate any great increase in the demand from the railroads in the immediate future. The distribution of orders on its long-standing list by the Chicago, Burlington & Quincy during the past week, therefore, was received with more than usual satisfaction. This road already has sent out orders for fully 50 tools, involving a large expenditure, and immediate action is expected on a considerable quantity of additional equipment. Simultaneously with the placing of this business, the Seaboard Air Line issued the largest formal list which has come from a railroad in some time. This list involved nearly 100 tools, and distribution of orders is expected without delay, since it is based on preliminary inquiries which the Seaboard Air Line has put out in the last few months. In addition to these developments, several other roads are inquiring, at least in a preliminary way, and, altogether, the situation in the railroad end of the machine tool market reflects a distinct improvement. The Pennsylvania railroad is inquiring for a bolt cutter and several other tools. The Southern Pacific railroad is in the market for a drill press and a few other tools.

The war end of the machine tool market continues very active. A feature of leading interest is a movement to form a large new company to engage in the manufacture of all kinds of war munitions, which is being gotten under way by interests identified in a large way with war contracts already placed. These interests plan to engage all or part of the producing capacity of a number of large plants in this country and Canada and provide them with such additions to equipment as will enable them to turn out war munitions on a large scale. In connection with this project, inquiries have been made quietly for a large amount of machinery for future delivery. Among concerns which have made large additional purchases are the Remington Arms and Westinghouse interests. The International Steam Pump Co. has closed for some additional equipment, having bought several hundred lathes and other machines during the past few weeks. The Lake Torpedo Boat Co., Bridgeport, Conn., has bought a considerable number of new machines and still is inquiring. Among concerns which now are figuring on machine tools for making shrapnel or high explosive shells are the Ellicott Machine Co., Baltimore; the Spedden Ship Building Co., Baltimore, the Roberts Safety Water Tube Boiler Co., Red Bank, N. J., and others.

Foreign demand continues active, although not on as large a scale as several weeks ago. A feature of this foreign business is the growing disposition of leading machinery dealers and manufacturers to refrain as much as possible from doing business with commissions which are here from foreign countries, this being due to long delays and other obstacles encountered. By far the greater portion of the business now being placed from abroad is being taken directly through foreign agents or through large machinery houses located in the various countries. The Royal Hellenic Engineering Commission, 30 Church street, New York, has made some good-sized purchases recently in the interest of the Greek government.

Domestic business, not related to the war, is rather slow. The Nelson Tool Co., New York, has bought a few tools; an automobile company with plant near New York, and the Montclair, N. J., high school, has each bought several thousand dollars worth of tools. The General Vehicle Co., Long Island City, continues to negotiate on large requirements. The Miami Copper Co., 61 Broadway, New York, is in the market for a rail-bending machine. The General Electric Co. has put out inquiries for three or four tools. Included in new crane business is a contract for a 40-ton skull-cracker crane, awarded by the Bethlehem Steel Co. to the Alliance Machine Co., Alliance, O. The Treadwell Engineering Co., Easton, Pa., has bought a 10-ton Alliance crane. The Norton Grinding Co., Worcester, Mass., ordered a 10-ton crane, the Bethlehem Foundry & Machine Co., South Bethlehem, Pa., a 25-ton crane and the Standard Underground Cable Co. a 5-ton crane. These three cranes went to the Pawling & Harnischfeger Co. The American Smelting & Refining Co., 165 Broadway, New York, is taking bids on one 30 and one 60-ton crane; this company recently took bids on one 50-ton crane. The United States Cast Iron Pipe & Foundry Co. is in the market for a ladle trolley of special construction. Among concerns in the east who are extending their manufacturing capacity are the Colt Patent Fire Arms Co., Hartford, Conn.; Kinney Mfg. Co., Boston; Crompton & Knowles Loom Works, Worcester, Mass.; H. H. Franklin Mfg. Co., Syracuse, N. Y.; Brunner Mfg. Co., Utica, N. Y.; American Radiator Co., Buffalo, and numerous others.

Better Domestic Demand at Pittsburgh

MACHINE tool dealers in the Greater Pittsburgh district are enjoying increased demand for equipment for domestic use. Inquiries for lathes and special machinery for the manufacture of war material also are coming out in heavy volume. One inquiry this week involves 100 lathes for shipment to a small maker. The Standard Tin Plate Co., Canonsburg, Pa., has awarded contracts for some equipment required for the addition to its works. The Mesta Machine Co., Pittsburgh, will furnish 12 stands of cold mills, two pickling machines and a large bar shear; the Hyde Park Foundry & Machine Co., Hyde Park, Pa., has the contract for 12 hot mills and the Shaw Electric Crane Co., New York, will furnish four 10-ton electric cranes for handling annealing boxes. Revised specifications for tin plate mill equipment for the McKeesport Tin Plate Co., McKeesport, Pa., which will add 20 new mills, have come out this week. The Carbon Steel Co., Pittsburgh, has purchased a 10-ton Shaw crane, and the Pittsburgh Crucible Steel

The Only Floor that Made Good in this Plant

¶ Every other floor the Lakeside Malleable Castings Company ever had in the annealing room failed under this heavy steam charging truck. Not one of them could withstand such conditions of extreme load, wear and heat.

¶ Finally—the company put down this wood block floor. After being in service continually for over a year, it is better than when laid.

¶ Both these statements come directly from the President of the Company in his endorsement of

Ayer & Lord Interior Wood Block Floors

¶ The floor is smooth—and it grows firmer, more compact and serviceable, the more it is used. Great loads and hard trucking have not changed its levels or affected its surface.

¶ The practice in this plant is to deliver pots directly from the furnaces and tear them down on the floor. Under this treatment it does not show char.

¶ AYER & LORD creosoted blocks are cut from selected long leaf yellow pine—a wood notable for the extreme density of its fibre—treated by special process. This is what gives these blocks their extraordinary strength and resistance to both wear and heat.

¶ You may not have just the same proposition, but the proof is here of the marvelous utility, durability and economy of AYER & LORD WOOD BLOCK FLOORS.

Ayer & Lord Wood Block Floors

Carry the heaviest loads—
Stand the hardest wear—
Resist fire and heat—
Don't swell or buckle—
Don't damage tools—
Are dustless, noiseless, dry and sanitary—
Easy on the feet.

Write us for new booklet "FLOORS"

It contains further information—photographs of installations of every character. Tell us something of your problems—our Engineering Department will gladly advise and specify to suit your conditions, without any obligation being incurred.

Ayer & Lord Tie Company
General Office: Railway Exchange, Chicago

CLEVELAND, OHIO
926 Illuminating Building

KANSAS CITY, MO.
1117 Rialto Building

MEMPHIS, TENN.
1402 Exchange Building

PHILADELPHIA, PA.
319 Perry Building

Co. has ordered a 10-ton electric crane with a 100-foot span from the Morgan Engineering Co., Alliance, O. The crane will be installed in the plant at Midland, Pa. Plans have been practically completed for the erection of a steel tube plant at Ellwood City, Pa.; promoters are J. H. Nicholson, J. J. Dunn and J. W. Offett, all of whom are connected with the Shelby Steel Tube Co., a subsidiary of the Steel Corporation. The Trumbull Steel Co., Warren, O., is considering an increase in capital stock from $2,500,000 to $4,000,000, to provide additional sheet and tin mill capacity.

Big Sales at Chicago

DETAILS concerning the unincorporated and nameless company, referred to by *The Iron Trade Review* two weeks ago, continue to come out although the identity of those behind the organization has not been disclosed. The company is known to have bought about $750,000 worth of machinery, mostly lathes and screw machines, in two lots. Potter & Johnson are said to have taken a contract for $500,000 worth of lathes and screw machines and the Hendey Machine Co., Torrington, Conn., is said to have made a contract for about $275,000 worth of the same class of equipment. Delivery on this large quantity of machinery is desired as early as possible but nothing has been promised short of several months. Negotiations are said to be pending for two or three plants now vacant in Chicago, where this equipment will be installed and the manufacture of war munitions taken up.

The Edward Valve Co., Chicago, has recently placed an order for a large number of lathes. The Burlington railroad has closed for a portion of its inquiry for tools, the list having been revised and cut down three times before any purchases were made. The final buying was much short of the original inquiry and was scattered among a number of sellers. Inquiries are current for about $10,000 worth of lathes for the government arsenal at Rock Island and for a heavy list of various shop tools to be sent to Seattle, Wash., for government use. This activity on the part of the government is regarded as significant.

Demand from Canadian sources for lathes continues, but its character is undergoing a change. Machinery for handling rounds up to 4 to 5 inches, is now desired rather than smaller sizes.

Shortage of milling machines is almost as acute as in the case of lathes, this apparently coming as a secondary effect of war demand. Concerns operating large machine shops find they must install milling machines to make and keep in condition their equipment instead of depending on outside shops. Demand for tool room lathes is increasing, although it has not yet caused a shortage. This is attributed to the same cause that has reduced the supply of milling machines. Forging hammers and radial drills are also in better demand. Delivery of machinery from manufacturers ranges from six to eight months, but sales are being made continually and the delivery probably will be pushed further and further into the future.

Demand Slackens at Cincinnati

IN CINCINNATI, there is a noticeable falling off in inquiries from Europe for machine tools. Manufacturers there cannot make deliveries for more than a month, and European representatives, who want immediate shipments, are going elsewhere to place their orders. Domestic business also is less than last month, but all plants making lathes, drills, milling machines and planers have full order books extending until about September. An inquiry for 200 lathes from Canada is before the market, but there is small chance of any manufacturer here taking this business because of the quick deliveries wanted. The Cincinnati Iron & Steel Co. will manufacture lathes, and has incorporated the Cisco Machine Tool Co. Plans are on foot to take over a lathe plant here.

EASTERN STATES

BOSTON.—Whipple F. Smith, has been granted a permit to erect a light manufacturing building at 129 to 139 Tyler street.

BOSTON.—Thos Renyon, 46 Sprague street, West Roxbury, has been granted a permit to erect a frame machine shop.

BOSTON.—J. Nichols & Son, 188 Providence street, Hyde Park, have been granted a permit to erect a brick manufacturing building.

BOSTON.—J. L. Hammett Co., 250 Devonshire street, manufacturer of school supplies, soon will let contract for a 3-story and basement, 100 x 100-foot factory.

BOSTON.—Kinney Mfg. Co., manufacturer of pumps, compressors, etc., has bought the plant of the American Linen Thread Co. on Washington street, in the Jamaica Plain district. The company will abandon its old plant on Albany street and expect to be operating in the new plant by Sept. 1.

WORCESTER, MASS. — Crompton & Knowles Loom Works, due to overcrowded conditions at its foundry at 123 Tainter street, has resumed operations at the old Star foundry, idle for several years. The company may enlarge its Tainter street foundry.

BRIDGEPORT, CONN.—Remington Arms-Union Metallic Cartridge Co. has let a contract for two new buildings, 68 x 112 and 49 x 210 feet, each one story.

BRIDGEPORT, CONN.—Bridgeport Projectile Co. has let contract for 2-story 60 x 350-foot projectile shop and a 1-story, 100 x 400-foot forge shop.

HARTFORD, CONN.—Colt Patent Firearms Co., which was planning to build a large addition, has abandoned this project. Instead, the company has decided to vacate the West armory on Huyshope avenue, and renovate this building and equip it with machinery for the manufacture of machine guns and other arms. The present tenants of the building, including the Maxim Silencer Co., the Sterling Blower Co., the Hartford Auto Parts Co. and the Asa S. Colt Co., will be forced to find new quarters.

AMSTERDAM, N. Y.—Perkins Foundry Co., hardware, engines, boilers, has been incorporated; $20,000 capital stock; by W. E. and E. Walker, D. B. Perkins, Amsterdam.

AUBURN, N. Y.—Firth Carpet Co. is building a 1-story, 105 x 150-foot addition.

BROOKLYN.—Automobile Supply Mfg. Co., 220 Traffic place, suffered damage by fire.

BROOKLYN.—Wrought Iron & Art Glass Fixtures Co., 6 Howard street, suffered damage by fire. F. J. Hills Sons machinists, at the same address, also suffered loss.

BROOKLYN.—Keesal Engineering Works has been incorporated; $5,000 capital stock; by T. Keenan, A. and G. Sahlman, 74 Middleton street, Brooklyn.

LONG ISLAND CITY, N. Y.—Studebaker Corporation of America will lease a 4-story, 80 x 160-foot building, which now is being constructed on Anable street, by the Degnon Realty & Terminal Improvement Co., New York.

NEW YORK.—Seaboard Air Line has put out formal inquiries for nearly 100 machine tools.

NEW YORK.—Pennsylvania railroad is inquiring for a bolt cutter and some other tools.

NEW YORK.—Miami Copper Co., 61 Broadway, is in the market for a railbending machine.

NEW YORK.—Southern Pacific railroad, 165 Broadway, is in the market for a drill press and a few other tools.

NEW YORK.—American Smelting & Refining Co. is taking bids on one 60 and one 30-ton crane. Bids are in on a third crane having capacity of 50 tons.

NEW YORK.—Harper Auto Safety Signal Co. has been incorporated; $500,000 capital stock; by W. H. Thompson, H. John, and H. Harper, New Bedford, Mass.

NEW YORK.—American Magnet Power Co. has been incorporated; $200,000 capital stock; by C. Winthrowd, W. T. Liberenz, T. J. Scherer, E. R. Thomas, Rector street.

NEW YORK.—Power Generating Co., mechanical contrivances for generating power, has been incorporated; $10,000 capital stock; by C. A. Brodek, W. H. Kimmel, F. Krause, 22 West Nineteenth street.

NEW YORK.—Bids will be asked about Aug. 1 for the construction of the Westchester county penitentiary and work house at Eastview. The work will be under the supervision of the Westchester county building commission, comprising Robert S. Brewster, Mount Kisco; George E. Mertz, Port Chester, and Arthur W. Lawrence of Bronxville.

OSSINING, N. Y.—Simplex Rubber Co.

of America has been incorporated; $300,000 capital stock; by A. C. Travis, E. Gynne, Evans, N. A. Campbell, 31 Pine street.

RED BANK, N. J.—Roberts Safety Water Tube Boiler Co. is in the market for equipment for making shrapnel.

ROCHESTER, N. Y.—Frank H. Falls, 336 State street, will build a 1-story, 24 x 50-foot factory on Mill street.

SCHENECTADY, N. Y.—General Electric Co. has put out inquiries for a few machine tools.

SYRACUSE, N. Y.—Hammond Steel & Forging Co. is in the market for several special hammers.

SYRACUSE, N. Y.—H. H. Franklin Mfg. Co. will build a 4-story, 160 x 153-foot addition to its automobile factory.

UTICA, N. Y.—Savage Arms Co. has let contract for a new boiler house, one story, 50 x 120 feet.

UTICA, N. Y.—Bruner Mfg. Co. has let a contract for a 1-story, 77 x 180 foot and 49 x 49-foot machine shop.

UTICA, N. Y.—E. D. & A. F. Cronk, 68 Hotel street, has let a contract for the addition of two stories to its 4-story, 85 x 97-foot machine shop.

ALICIA, PA.—Alicia Sand Co. has been organized with a capital of $20,000 by J. Y. Binns, Brownsville; James M. Clark, Fayette City and Charles T. Colbert Jr., Alicia.

ELLWOOD CITY, PA.—American Steel Co., with offices in Pittsburgh, will erect an addition to its plant for the manufacture of nails; M. B. Kelley, Pittsburgh, is in charge.

ERIE, PA.—Ajax Sand Co., capital $10,000 has been incorporated by T. B. Ely, William L. Scott and F. H. Flowers; the company has purchased sand properties in northwestern Ohio, near Conneaut.

LATROBE, PA.—It is officially advised the Latrobe Electric Steel Co. has adopted plans for the installation of a rolling mill department, complete forging department, etc., for the manufacture of high speed steel and other high grade carbon and alloy steels; the plant now is equipped with a 6-ton Heroult electric furnace and additional electric furnace capacity will be provided; Charles W. Guttzeit is vice president and general manager; E. T. Edwards is second vice president.

PHILADELPHIA.—Automobile Construction & Mfg. Co. has been incorporated; $5,000 capital stock; by Thomas K. Conderman and George H. Jones.

PITTSBURGH.—Northern Railway Signal Co. has been incorporated; $15,000 capital stock; by Joseph P. Taggert, E. A. Schooley, Pittsburgh; Herbert L. Stitt, Edgeworth, Pa.

PITTSBURGH.—Faber Engineering & Construction Co. has been incorporated with a capital of $5,000 by Walter F. Faber, Pittsburgh; Ernest H. Walker, Woodlawn, Pa. and James E. Simpson, Racine O.; to build bridges and roads.

GARWOOD, N. J.—Hall Switch & Signal Co. will expend about $50,000 for new machinery to turn out war munitions.

KEYPORT, N. J.—Board of freeholders will open bids on Aug. 4 for the construction of a $40,000, 60 x 260-foot bridge of the strauss bascule trunnion type.

MORRISTOWN, N. J.—Knight Construction Co. has been incorporated; $50,000 capital stock; by D. J. Knight, E. A. Carpenter, L. W. Ward, all of Morristown.

NEWARK, N. J.—Universal Caster & Foundry Co. has been granted a permit to make alterations at its brick storage building.

NEWARK, N. J.—New Jersey Zinc Co., 810 Broad street, has increased its capital stock from $10,000,000 to $35,000,000. The company will mine zinc and other ores and manufacture metals. The incorporators are Benjamin F. Clarke, Jersey City; Albert F. Dawson, Elizabeth, N. J., and others.

NEW BRUNSWICK, N. J.—Perfection Mfg. Co. has been incorporated to manufacture machinery and steel slides for windows; $16,000 capital stock; by John Watson, August C. Streitwolf and L. P. Johnson.

PERTH AMBOY, N. J.—East Jersey Bridge Co. has been incorporated to manufacture and construct bridges; $100,000 capital stock; by O. W. Ramsey, J. Brennan, E. G. Frazer, C. R. Abell, all of Perth Amboy.

SOMERSVILLE, N. J.—Sutton & Ernst will erect a steel bridge over Polhemus creek.

Mr. On-the-Job Attention!

Here's the cream of week's best business news.

Skim it.

Miami Copper Co., 61 Broadway, New York City, is in the market for a rail bending machine.

Southern Pacific railway, 165 Broadway, New York City, is in the market for a drill press and a few other tools.

American Smelting & Refining Co., 165 Broadway, New York City, is taking bids on one 60-ton and one 30-ton crane.

Pennsylvania railroad, New York City, is inquiring for a bolt cutter and some other tools.

Spedden Ship Building Co., Baltimore, is in the market for equipment for manufacturing shrapnel.

General Electric Co., Schenectady, N. Y., is inquiring or a few machine tools.

Roberts Safety Water Tube Boiler Co., Red Bank, N. J., is in the market for equipment for manufacturing shrapnel.

Ellicott Machine Co., Baltimore, is in the market for machine tools for manufacturing high explosive shells.

Seaboard Air Line, New York City, has put out formal inquiries for nearly 100 machine tools.

Hammond Steel & Forging Co., Syracuse, N. Y., is in the market for several special hammers.

Ward Nail Co., with works at Struthers, O., has increased its capital stock to double the plant's capacity; 12 new nail machines will be installed.

Latrobe Electric Steel Co., Latrobe, Pa., plans installing a rolling mill department, complete forging department, etc., for the manufacture of high speed steel and other high grade carbon and alloy steels.

Hydraulic Pressed Steel Co., Cleveland, which is erecting a $75,000 addition for the manufacture of shrapnel, will be in the market shortly for the necessary equipment.

TRENTON, N. J.—John A. Roebling Sons' Co. will build a $15,000 addition.

BALTIMORE.—Spedden Ship Building Co. is in the market for equipment for making high explosive shells.

BALTIMORE.—Spedden Ship Building Co. is in the market for equipment for making shrapnel.

WASHINGTON.—Bureau of supplies and accounts, navy department, is taking bids till Aug. 10 on a sandblast outfit for the Puget Sound navy yard and on a refrigerating plant, 15 feed, fire and bilge pumps and one auxiliary condenser for Mare Island.

CENTRAL STATES

CANTON, O.—Zahner Metal Sash & Door Co. is having plans prepared for a 1-story, 100 x 400-foot factory building. J. P. Sidney Morgan, secretary-treasurer.

CANTON, O.—Bids will be received shortly for three buildings, each 100 x 300 feet, one story, for the Timken Roller Bearing Co. H. Vanderbeck, chief engineer of the company, is drawing the plans.

CINCINNATI.—It has been announced that the completed plans for the new 12-story Y. M. C. A. building will be ready about September, costing $300,000. It is very probable that the structure will have a framework of steel.

CINCINNATI.—Bids will be taken soon, and work commenced about Oct. 1 on the proposed $1,000,000 high school, which will be erected at Madison road and Erie avenue. A manual training department will be included, requiring entire equipment.

CINCINNATI.—A $100,000, 24 x 116-foot, 11-story addition will be built to the office building of the Provident Bank & Trust Co. Plans are being prepared by Harry Hake, architect, Cincinnati. The new portion will be patterened after the present building, and will have a framework of steel.

CLEVELAND.—Cyclone Woven Wire Fence Co. has changed its name to the Cleveland Cyclone Fence Co.

CLEVELAND.—Engineering Equipment Co. has changed its name to the Baker-Dunbar-Allen Co.

CLEVELAND.—William W. Taylor Machine Co. has awarded the W. Dunbar Co. the contract for erecting a $5,000, 43 x 100-foot, brick shop addition.

CLEVELAND.—Bids will be received shortly by Ernest McGeorge, architect, for another building to be erected in Cleveland for the Elyria Iron & Steel Co.

CLEVELAND.—Cleveland Metal Products Co. has received plans for the erection of an $18,000, 2-story, brick and steel building at 1141 Ivanhoe road. George S. Rider & Co. are the contractors.

CLEVELAND.—Lake Erie Refining & Smelting Co. will erect a $7,000, 1-story, brick and concrete foundry addition, 30 x 55 feet, at 7800 Bessemer avenue. Wilbur J. Watson, Cleveland, is architect.

CLEVELAND.—Hill Clutch Co., West Sixty-fifth street and the New York Central railroad tracks, will hold plans in abeyance for $150,000 worth of buildings, including machine shop and office building. J. B. Perkins is president.

CLEVELAND.—Hydraulic Pressed Steel Co. has granted Samuel W. Anderson the general contract for erecting its proposed $75,000, 75 x 350-foot, brick and steel factory addition. The company is preparing a list and will be in market shortly for necessary equipment.

CLEVELAND.—County commissioners made the first move towards the erection of a second high level bridge over the Cuyahoga river when they authorized a $100,000 bond issue to provide for enginering surveys and

land options. The proposed bridge, which will connect Lorain avenue, either with Huron road or Bolivar road, will cost about $5,000,000 and will be 3,800 feet in length. It is probable that actual construction will not begin for two years, as the river will have to be straightened at the point where the bridge will cross.

COLUMBUS, O.—Franklin county commissioners, John Scott, clerk will open bids July 30 for the erection of several bridges in Madison township.

FINDLAY, O.—Ray M. Fuller is preparing plans for a 50 x 133-foot addition to the plant of the Toledo Ford Tire Co. at Western and Lima avenues.

IRONTON, O.—J. F. Witmer Co., engineer, Buffalo, N. Y., has completed plans for the proposed municipal water works, including pumping station, filtration plant, reservoir and two miles of large pipe, to cost in all about $250,000. Bonds will be issued at once and bids will be taken about Aug. 1.

LEBANON, O.—John M. Mulford, county auditor, will receive bids until Aug. 2 for a creosoted plank and block floor for a bridge over Clear creek in Franklin, also for a bridge over the Little Miami river in Union and Hamilton townships, South Lebanon. Separate bids are invited on each job; certified check for $1,000 required.

MANSFIELD, O.—John A. Dalton, county auditor, will open bids July 28 for constructing the Orange street bridge. Certified check for $500 required.

TOLEDO, O.—Bids for the Champion street bridge have been rejected and new bids are to be advertised immediately.

TOLEDO, O.—Cortland Bros. and associates of Marion, Ind., plan a plant to be located on the east side, either on the Wheeling & Lake Erie or terminal railroad, to be known as the Grey Iron Foundry. Building, grounds and equipment will cost about $35,000 and 150 men will be employed. No contracts for construction work have been let.

WARREN, O.—Directors of the Trumbell Steel Co. have unanimously recommended an increase in the capital stock from $2,500,000 to $4,000,000 for the erection of additional sheet and tin plate mills. A meeting will be held Aug. 6 when formal action will be taken on the recommendation.

YOUNGSTOWN, O.—Ward Nail Co., with works at Struthers, O., has increased capital stock to double work's capacity; 12 new nail machines will be installed.

YOUNGSTOWN, O.—Citizens have subscribed $21,000 toward an armory and convention hall; the state of Ohio will appropriate about $40,000 for the building.

ZANESVILLE, O.—County commissioners will consider the replacement of bridges recently badly damaged by storm.

DAWSON SPRINGS, KY.—Western Kentucky & Smelting Co., capitalized at $20,000 will develope zinc and lead deposits in that section. A smelter will be established at Dawson Springs, Ky., to reduce the carbonate of zinc. D. C. Roberts is manager.

GLASGOW, KY.—Charles Shannon can furnish information regarding rebuilding the stave mill of H. A. Moss, in which he is interested.

HAZARD, KY.—R. F. Peters, president of the Perry County Block Coal Co., organized at $100,000, is in charge of the purchase of mining equipment.

HAZARD, KY.—Blue Diamond Coal Co. will install a mining plant on a large tract of coal land, just leased. It is understood the machines will be electrically operated.

HENDERSON, KY.—Henderson Traction Co. is reported to be considering extensive improvements in its plant and roadway.

LEXINGTON, KY.—Kentucky Utilities Co. considers establishing two substations in Lexington with a capacity of 200 to 300 kilowatts.

LEXINGTON, KY.—Plans for the proposed bridge across the Kentucky river have been presented to Judge F. A. Bullock, and as soon as approved bids will be advertised.

LOUISVILLE, KY.—Graf Stove & Range Co. contemplates the equipment of a foundry. It is now assembling and finishing stoves.

LOUISVILLE, KY.—J. V. Pilcher Mfg. Co. is establishing a branch plant, for the manufacture of a metal specialty, at Windsor, Ont., in charge of Thomas P. Archer.

LOUISVILLE, KY.—Ditsler-Wheeler Engine Co. has been incorporated; $10,000 capital stock; by P. R. Disler, C. J. Meddis and Huston Quinn.

LOUISVILLE, KY.—Woodford Shannon, 827 South Fifteenth street, will purchase equipment for manufacturing coiled wire bed springs and similar goods. The machines will be motor driven.

LOUISVILLE, KY. — Kentucky Carbonic Co. will establish a plant at Thirtieth and Kentucky streets for the manufacture of carbonic acid gas; address S. Leidigh, 617 South Second street.

LOUISVILLE, KY. — George H. Rommel Co. has the general contract for the erection of the Y. W. C. A. building on its bid of $130,000. John B. Hutchins & Son are the architects.

SMITHLAND, KY.—An electric light plant will be established by a company which is being organized by J. W. Watters, Lewis Conner and V. D. Presnell.

DYER, IND.—Bids will be received until Aug. 5, by George A. Schaff, county commissioner, at the office of E. O. Simon, county auditor, Crown Point, Ind., on a concrete encased steel girder bridge at Joliet street.

EVANSVILLE, IND.—First Avenue Brick & Tile Co. plans expending $20,000 for additional equipment.

EVANSVILLE, IND.—Evansville Henderson Traction Co. plans constructing an electric railway from Henderson, Ky., to Morganfield, Ky.

EVANSVILLE, IND.—W. H. McCurdy, president of the Hercules Buggy Co., will organize a new concern for manufacturing farm tractors.

EVANSVILLE, IND.—Schmitt, Berendes & Schmitt will purchase a freight elevator and machine tools for a garage, which will be erected shortly.

FORT WAYNE, IND.—Pennsylvania railroad and the Wabash railroad have submitted plans to the city for grade separations.

FRANKFORT, IND. — Indiana Brass Co. has increased its capital stock from $10,000 to $25,000.

INDIANAPOLIS.—Citizens Gas Co. has awarded a contract for a benzol plant to the Otto Coking Co., 6 Church street, New York.

INDIANAPOLIS.—E. C. Atkins Co. tool manufacturer, is to build a 2-story, 100 x 400 foot, reinforced concrete addition, costing $130,000.

INDIANAPOLIS. — Indianapolis Light & Heat Co. is to build a brick addition to its plant at a cost of $14,000. Thomas A. Wynne, vice president and treasurer.

LA PORTE, IND.—The manufacture of a patented spark plug is contemplated by the Spoon Spark Plug Co.; E. E. Weir is president.

MADISON, IND.—Thomas Graham Co., spoke manufacturer, will rebuild its plant recently burned with $25,000 loss.

MADISON, IND.—Thomas Graham Spoke Co. has decided practically to rebuild its plant, recently burned with $25,000 loss. John B. Ross is president.

CHICAGO.—Imperial Vacuum Heater Co. has been incorporated to manufacture and deal in heating specialties; $30,000 capital stock; by Burton C. Hills, William H. Beall and William V. Rifle.

CHICAGO.—American Car & Foundry Co., Railway Exchange building, is to build a 1-story steel car shop at 2416 South Paulina street, costing $20,000; A. A. Brown is architect.

CHICAGO.—K. & G. Machinery Co. has been incorporated to manufacture machinery; $10,000 capital stock; by Wyant V. Gush, Frank A. Mombleau and Henry Kreutzman, 3321 Vernon avenue.

CHICAGO.—Bermingham & Seaman Co., Tribune building, paper manufacture, will erect a 7-story paper warehouse instead of a 7-story paper mill as was previously reported. Paul Gehrhardt is the architect and O. W. Rosenthal the general contractor.

GALESBURG, ILL.—Chicago, Burlington & Quincy railroad, L. N. Hopkins, purchasing agent, 547 West Jackson boulevard, Chicago, is to rebuild its blacksmith shop at Galesburg recently damaged by fire, at a cost of $14,000. Kenwood Bridge Co. has been awarded the contract for steel roof trusses. The shop is one story, 70 x 200 feet.

HILLSBORO, ILL.—Southern Illinois Light & Power Co. has increased its capital stock to $2,000,000.

BATTLE CREEK, MICH.—Michigan Railroad Co. will erect a combination freight house and car barn on River street at an estimated cost of $100,000. Plans by W. G. Farge, Jackson, Mich.

GRAND RAPIDS, MICH.—Walter S. Austin of the Austin Automobile Co., announces the Grand Rapids plant of the company will be enlarged.

KALAMAZOO, MICH.—D'Arcy Spring Co. is in the market for a second-hand 16-inch shaper.

MILWAUKEE. — Chicago & Northwestern railroad, W. H. Finley, chief engineer, Chicago, will receive bids until July 31 on a 1,500,000 bushel grain elevator costing $1,000,000. Foltz Engineering Co., 1410 Pioneer building, St. Paul, is engineer.

MILWAUKEE.—The shop and warehouse of the Cohen Machinery & Iron Co., the Milwaukee Plumbing & Heating Supply Co. and Purity Supply Co. at 142-144 West Water street, was slightly damaged by fire. The total loss of $2,500 is attributable mainly to water damage.

MILWAUKEE.—The general contract for the construction of the $250,000 Ford Motor Co. branch plant at Milwaukee, has been awarded to the O. H. Bossert Co., 848 Jackson street, Milwaukee, by Detroit architects. The Bossert company is taking bids for various material, including reinforcing bars, structural shapes, steel sash, wire glass, etc. Its contract does not include heating, plumbing and lighting. The building is to be ready Dec. 1.

RACINE, WIS.—Overland Shoe Co., Union street, is about to erect two new factory buildings, each two stories high, of solid brick construction, measuring 30 x 40 and 28 x 40 feet.

WATERTOWN, WIS. — Bids will be received about July 20 for erecting a high school costing $110,000, and containing a complete manual training department. Plans have been completed by Parkinson & Dockendorff, architects, LaCrosse, Wis.

BONNE TERRE, MO.—Mississippi River & Bonne Terre railroad has applied for a permit to issue $250,000 in bonds and increase its capital stock from $300,000 to $3,250,000. F. J. Thomure is general manager.

KANSAS CITY, MO. — Columbian Steel Tank Co. has bought a site at Twelfth and Wyoming streets and will build a 1-story factory, 50 x 300 feet.

KANSAS CITY, MO.—Sheet Metal Products Co. has been incorporated; $12,000 cap-

ital stock; by John McClelland, C. A. Smith, J. P. Curry.

KANSAS CITY, MO.—American Institute of Homeopathy is to erect a hospital and school in Kansas City at a cost of $1,000,000.

IOWA CITY, IA.—Plans are being made by Proudfoot, Bird & Rawson, architects, Des Moines, for a 4-story, 78 x 180 foot, steel building for the dental department of the Iowa University, costing $175,000. The state board of education will let the contract about August 24.

DULUTH, MINN.—Plans are being made for an addition to the plant of McKeesport Tin Plate Co., at Duluth.

MINNEAPOLIS. — Minneapolis General Electric Co. plans to construct 75 miles of transmission lines at a cost of $100,000. R. F. Pack is general manager.

ST. PAUL.—Brown, Treacy & Sperry Co., Fifth and Minnesota streets, has plans by C. H. Johnston, 715 Capital Bank building, for a manufacturing building, three stories, 100 x 150 feet, costing $50,000.

SOUTHERN STATES

LAKE CHARLES, LA.—Parish bridge engineer is preparing plans for a steel draw bridge over the intercoastal canal and a steel bridge over Bayou Chaupique, near Vinton, La.

EL PASO, TEX.—O. H. Ensign, engineer, will report soon on the feasibility of installing a power plant at Elephant Butte dam.

CHATTANOOGA, TENN.—William Blecker plans establishing a $100,000 steel sheet mill, and has secured a site on Mocassin Bend. C. E. James is interested.

KNOXVILLE, TENN.—John G. Duncan Co., a machinery concern, wants prices on a second hand belt or steam driven air compressor with a capacity of 175 cubic feet per minute.

LENOIR CITY, TENN.—Town Creek Milling Co. will rebuild its flour mill and also equip a 25,000-bushel grain elevator. The new plant will cost $40,000.

MEMPHIS, TENN.—Layne & Bowler Co. is establishing a plant at Chelsea and May streets for the manufacture of turbine pumps and water works equipment. It is consolidating a number of plants, heretofore operated elsewhere, in Memphis.

NASHVILLE, TENN.—O. L. Jones Mill & Elevator Co. has increased its capital stock and is reported to have plans for enlargements; address O. L. Jones.

TULSA, OKLA. — County commissioners have decided the bridge over the Arkansas river is to have a 30-foot roadway and a four foot sidewalk, costing $183,000.

WESTERN STATES

MINOT, N. D.—Consumers Power Co. will spend $75,000 on additions and improvements and will install additional boilers, engines and machinery.

OSKALOOSA, KAN.—Harper & Stiles, engineers, Grand avenue Temple, Kansas City, Mo., are making plans for a water works system, including a pumping station.

ROBINSON, KAN.—Bonds for $10,000 have been voted for an electric light and power plant.

SIMPSON, KAN.—Rollins & Co., Midland building, Kansas City, Mo., engineers, are making plans for a municipal works system costing $10,000.

TOPEKA, KAN.—F. M. Newlands, city commissioner of water and lights, has asked an appropriation of $15,000 for a new unit in the electric light plant.

TOPEKA, KAN.—Bids will be asked soon on a three span reinforced concrete bridge across the Shunganunga creek at Kansas avenue costing $18,000. The Topeka Railway Co. will pay part. J. E. House is mayor.

WINCHESTER, KAN.—Harper & Stiles, Grand Avenue Temple, Kansas City, Mo., are making plans for a water works system, including a pump house and mains.

BUTTE, MONT.—Election will be held July 27 to vote on $100,000 bonds for a new jail building.

FROMBERG, MONT.—Bonds for $17,500 have been voted for a water works system, including a concrete pumping station and machinery and a concrete reservoir.

WHITEHALL, MONT.—City council has decided to construct a gravity water works system with a large steel tank to give a static pressure of 80 pounds per square inch, costing $16,000.

PHOENIX, ARIZ.—The board of supervisors of Gila county plans a $15,000 bridge over the Gila river at Winkleman.

BLACKFOOT, IDA.—Utah-Idaho Sugar Co. will install a $20,000 pumping plant.

BELLINGHAM, WASH. — It is reported owners of the Post Lambert mine in the Mount Baker district will spend about $25,000 for machinery and other improvements this season. These include a sawmill, generator, motor air compressor and drills.

DAVENPORT, WASH.—It is reported the Northern Pacific railroad will replace its track between Davenport and Cheney with new heavy steel.

PORT ANGELES, WASH.—Dann Bros. organized the Port Angeles Gas & Oil Co. and have started constructing a $50,000 gas plant.

SEATTLE.—Bids on the construction of the Stossell bridge were rejected. A. H. Cox & Co. was the low bidder at $14,735.

SEATTLE.—Trade Cash Register Co. has been incorporated to manufacture cash registers; $2,000,000 capital stock; by J. O. Almen, C. L. Lawry, J. McLain and others.

SPOKANE, WASH.—Plans have been completed by the Milwaukee railroad for the electrification of 440 miles of line through the Rocky and Bitter Root mountains; the cost to be $12,000,000 to $13,000,000.

SPOKANE, WASH.—Clearwater Gold & Copper Mining Co., made up of Spokane, Coeur d'Alene and Montana investors, contemplates placing a bond issue for $250,000 for the construction of a tramway and power plant at its mine near Amador, Mont.

TACOMA, WASH.—New power house, additional copper furnace and new machinery for many parts of the plant are to be added to the Tacoma smelter by the American Smelting & Refining Co., doubling the capacity.

EUGENE, ORE.—The city council has plans to install equipment to provide 1,250 kilowatt additional at the municipal plant, by steam power.

PORTLAND, ORE.—Camp & Dupuy are preparing plans for an $8,000, 2-story building to replace that owned by the Enterprise Planing Mill Co., recently badly damaged by fire.

PORTLAND, ORE.—Bids will be asked soon for installing cutting machinery and other equipment in the Dredge COLUMBIA of the Port of Portland, estimated cost is $22,500, E. W. Wright, port manager.

PRAIRIE CITY, ORE.—Prairie City Light Co. will begin construction on its new plant shortly at a cost of $50,000.

ST. HELENS, ORE.—St. Helens Ship Building Co. will start work at once on the construction of a 265-foot, 5-masted schooner, to be equipped with two Bolinger engines.

RICHMOND, CAL.—Fitzgerald Noble Co. is to build a factory to manufacture automobile accessories.

SAN FRANCISCO.—D. Breslauer Estate Co. is to build a machine shop in San Francisco at a cost of $6,000.

SANTA BARBARA.—Santa Barbara Gas & Electric Co. has appropriated $85,000 for additions and improvements to its gas plant.

CANADA

HAMILTON, ONT.—Bowes, Jamieson, Ltd., iron founder would like to get in communication with steel manufacturers who are in the position to supply steel rounds for high explosive shells, about 3¼ inches in diameter. The company will require 500,000 during the next 18 months.

LINDSAY, ONT.—F. P. Wilford & Co., Ltd., has been incorporated to manufacture machinery; $50,000 capital stock; by Frederick R. Wilford, Gerald H. Hopkins and George Donaldson.

TORONTO, ONT.—Universal Stove & Furnace Co., Ltd., has been incorporated; $500,000 capital stock; by George M. Kelley, John D. Falconbridge.

TORONTO, ONT.—Invincible Machine Co., Ltd., has been incorporated; $100,000 capital stock; by James Y. Murdock, E. E. Daykine and N. Sales.

TORONTO, ONT.—W. A. Swayze Co., Ltd., has been incorporated to manufacture automobiles; $40,000 capital stock; by Elmer M. Rowand, Oscar H. King and M. P. Van der Voort.

WINDSOR, ONT.—Swedish Crucible Steel Co. is to install equipment to double its capacity.

WINDSOR, ONT.—Vacuum Street Cleaning Machine Co., Ltd., has been incorporated; $175,000 capital stock; by William F. Blaney, Windsor, and George S. Clark, of Detroit.

MONTREAL. — Hepburn Bros., Ltd., has been incorporated to manufacture hardware and specialties; $100,000 capital stock; by Waldo N. Skinner, W. J. Rugsley and George G. Hyde.

QUEBEC.—Public Service Corporation of Quebec Ltd., has been incorporated to develop power by hydro electric plants for Quebec and Three Rivers; $3,000,000 capital stock; by Charles F. Branchaud, Milton L. Hersey and Howard Murray.

NEW CATALOGS

AIR COMPRESSORS.—A six-page folder, issued by the Gardner Governor Co., Quincy, Ill., is devoted to the extensive line of air compressors built by this company. These include the vertical type made in sizes from 6 to 140 cubic feet, belt and motor-driven sets, portable compressors, etc.

TERNE PRODUCTS.—The Wheeling Corrugating Co., Wheeling, W. Va., has compiled a 48-page catalog in which its long terne sheets and terne plate products are described and illustrated. More than eighty products are listed. Special interest attaches to this catalog because of the attention to terne sheets as a substitute for the galvanized variety.

TIME DEVICES.—Three attractive four-page folders have been issued by the International Time Recording Co., Endicott, N. Y., to describe its Chamberlain cost keeper, card time recorder, style No. 307-B, and automatic Dey time register. The cost keeper prints time records on any size, form, or thickness of card, registering either in tenths, sixtieths, or hundredths of an hour. The time recorder can be furnished to record weekly, two weekly, semi-monthly, and monthly pay periods. The Dey time register is fully automatic, registering being done at one operation. A two color ribbon attachment shows lost time in red and full time in blue. More than 250 separate machines for time and cost keeping are made by this company.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to July 1.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.95
Basic, Pittsburgh	13.95
Basic, eastern Pa.	13.75 to 14.00
Malleable, Pittsburgh	13.70 to 13.95
Malleable foundry, Chicago	13.00
Malleable foundry, Philadelphia	15.00 to 15.25
Malleable foundry, Buffalo	12.50 to 13.00
No. 1X foundry, Philadelphia	14.75 to 15.00
No. 2 foundry, Pittsburgh	13.70 to 13.95
No. 2 foundry, valley	12.75 to 13.00
No. 2 foundry, Cleveland	13.00
No. 2 foundry, Ironton	12.50 to 12.75
No. 2 foundry, Chicago	13.00
No. 2X foundry, Philadelphia	14.50 to 14.75
No. 2X fdy., N. J. tidewater	14.25 to 14.50
No. 2X foundry, Buffalo	12.50 to 13.00
No. 2 plain, Philadelphia	14.25 to 14.50
No. 2 plain, N. J. tidewater	14.00 to 14.25
No. 2 plain, Buffalo	12.25 to 12.50
No. 2 southern, Birmingham	9.50 to 10.00
No. 1 southern, Cincinnati	12.40 to 12.90
No. 2 southern, Chicago	13.50 to 14.00
No. 2 southern, Phila. delivery	14.00 to 14.25
No. 2 southern, Cleveland	13.50 to 14.00
No. 2 south'n, New York docks	13.75 to 14.00
No. 2 southern Boston, docks	13.75 to 14.00
No. 2 south. interior, New Eng.	14.50 to 15.50
No. 2 southern, St. Louis	12.90 to 13.40
Virginia No. 2X furnace	12.50 to 13.00
Virginia 2X, Philadelphia	15.25
Virginia 2X, Jersey City	15.50
Virgina 2X, Boston points	15.75
Gray forge, eastern Pa.	13.25 to 13.50
Gray forge, Pittsburgh	13.20
Gray forge, Birmingham	8.75 to 9.00
Silveries, 8 per cent, Jackson, O.	14.75 to 15.25
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	21.00 to 21.50
Lebanon low phos., furnace	16.50 to 17.00
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.25
Charcoal, Buffalo	15.75 to 17.00
Charcoal, Birmingham	21.00

IRON ORE

Lake Superior Ores.

(Lower lake ports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.45
Old range, non-Bess., 51½ per cent.	3.00
Mesabi non-Bessemer, 51½ per cent.	2.80

FOREIGN ORES

(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	8 to 8½c
For'n non-Bes., 50 to 65 per cent.	8 to 8½c

COKE

(At the ovens)

Connellsville furnace	$1.70 to 1.75
Connellsville fur. contr.	1.65 to 1.75
Connellsville furnace coke, fourth quarter	1.75
Connellsville foundry	2.00 to 2.40
Connellsville fdy. contr.	2.25 to 2.50
Wise county furnace	1.75 to 2.00
Wise county foundry	2.25 to 2.50
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.00
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro mang., furnace (prompt)	$100 to 115
Ferro mang. Balti. (future)	100.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent.	18.00 to 18.50
Ferro-sil., 11 to 12 per cent.	17.00 to 17.50
Ferro-sil., 10 to 11 per cent.	16.00 to 16.50
Ferro-sil., 9 to 10 per cent.	15.00 to 15.50

(Ferro-silicon quoted at furnace Ashland, Jackson and New Straitsville.)

Ferro-carbon titanium, carloads, per lb.	8c to 12½c
Ferro vanadium, Pbgh. per lb. alloy	$2.25
Ferro tungsten, per lb. of alloy	2.50
Ferro chrome, per lb., Niagara Falls	20c

SEMI-FINISHED STEEL

Open hearth billets, Phila.	24.06 to 24.56
Forging billets, Phila.	27.06 to 27.56
Forging billets, Pbgh.	27.00

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.45
From Pittsburgh	.619
From Youngstown	.639
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Wire rods, Pittsburgh	$26.00
Bess. Bill., Youngstown	20.50
Open hearth billets, Youngstown	20.50
Bessemer billets, Pittsburgh	21.00
Open hearth billets, Pittsburgh.	21.50
Bess. sheet bars, Youngstown	21.50
Op. h'th. sheet bars, Youngstown	21.50
Bess. sheet bars, Pittsburgh	21.50
Op. h'th sh. bars, Pbgh.	21.50 to 22.50
Muck bar, Pittsburgh	27.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8-lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs. Pbg. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo.	1.07c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c
Angle bars, st. sections, Chicago	1.50c
Spikes, railroad, Pbgh.	1.40c
Spikes, railroad, Chgo.	1.50c to 1.55c
Track bolts, Pbgh.	1.95c to 2.00c
Track bolts, Chgo.	2.00c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	3.00
New England	3.00
Philadelphia	2.79
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.38
New York and Brooklyn (by canal)	1.00 to 1.50
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago, to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.25c
Structural shapes, Chicago	1.44c
Structural shapes, Philadelphia	1.359c to 1.409c
Structural shapes, New York	1.369c to 1.419c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.39c to 1.44c
Tank plates, Pittsburgh	1.20c to 1.25c
Tank plates, Philadelphia	1.359c to 1.409c
Tank plates, New York	1.369c to 1.419c
Bars, soft steel, Pittsburgh	1.25c
Bars, soft steel, Chicago	1.44c
Bars, soft steel, Philadelphia	1.409c
Bars, soft steel, New York	1.419c
Hoops, carloads, Pittsburgh	1.25c to 1.30c
Bands, Pittsburgh	1.25c
Shafting, Pbgh., contr.	66 per cent off
Bar iron, Chicago	1.20c
Bar iron, Philadelphia	1.22c to 1.27c
Bar iron, New York	1.20c to 1.25c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.25c to 1.30c
Hard steel bars, Chicago	1.20c to 1.25c
Smooth finish, mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.75c to 1.80c
No. 28, black, Chicago	1.89c to 1.94c
No. 28, tin mill, black, Pbgh.	1.85c to 1.90c
No. 28, galvanized, Pbgh. (nom.)	4.50c to 5.50c
No. 28, galvanized, Chgo., nom.	
No. 10, blue, anld., Pbgh. nom.	1.35c to 1.40c
No. 10, blue, annealed, Phila.	1.509c to 1.559c
Tin plate, 100 lb., coke base.	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squarring	10 cents
Roller leveling	10 cents
Patent leveling and re-squarring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel, ¾ to 3 inches	79	57½
Iron, ¼ to 2½ inches	71	46
	Lap-weld.	
Steel, 2½ to 6 inches	78	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	73
Iron, 3½ to 4½ inches l. c. l.	61

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh	$1.60
Plain wire, jobbers, Pittsburgh	1.40
Galvanized wire, jobbers, Pbgh.	2.20
Polished staples, Pbgh.	1.70
Galvanized staples, Pbgh.	2.50
Barb wire, painted, jobbers, Pbgh.	1.70
Barb wire, galv., jobbers, Pbgh.	2.50